VOLUME II

COLLEGE OF AGRICULTURAL SCIENCES

LONG RANGE PLANS

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DEPARTMENT OF

ANIMAL SCIENCE

A REPORT TO THE PRESIDENT
of
MEDIUM AND LONG RANGE PLANS FOR THE
DEPARTMENT OF ANIMAL SCIENCE
SCHOOL OF AGRICULTURE
TEXAS TECHNOLOGICAL COLLEGE
August 31, 1968

I. Origin and Development of the Department of Animal Science.

The Department of Animal Husbandry was established in 1925 in the Division of Agriculture. The instructional program was designed to train students to select, breed, feed, manage, and market farm and ranch animals and poultry. It was the function of this department to furnish students with the instruction and facilities to develop a background of sound principles, information, and skills which would enable him either to conduct livestock enterprises, or to engage in general farming, in which the production and utilization of livestock became integral parts of this system of farming. Students majored in the Department of Animal Husbandry as candidates for the Degree of Bachelor of Science of Agriculture.

During the early development the Department owned two breeds of beef cattle, and three breeds each of dairy cattle, hogs, horses, and sheep; one breed of goats; and three varieties of poultry - all of which were maintained primarily for class instruction. Equipment of the Department included a livestock judging pavilion, a dairy barn with silo, three horse barns, a central hog house, and a small meats laboratory. The Department had available approximately 1,600 acres of pasture and cropland which was used to maintain the herds and flocks. Laboratory equipment for instruction in veterinary science, poultry, breeding, meats, and livestock feeding and production was also available.

As indicated in Table 1, W. L. Stangel was appointed as Professor and Head of the Department of Animal Husbandry in 1925. Professor Stangel served in this capacity until his appointment as Dean of the College of Agriculture in 1946. Professor Stangel developed the basic concepts and philosophy of the Departmental Program that was to carry through for three decades. Additional staff who have served the Department since its inception are listed in Table 1.

Table 1

Instructional Staff

	Dates of Appt.	Highest Rank	Highest Degree
W. L. Stangel	1925-58	Prof. & Head (Dean of Agr.)	M.S. 1916 U. Of Mo. LLD Texas A&M
R. C. Mowery	1926-60	Prof. & Head	M.S. 1926 Iowa S.C.
F. G. Harbaugh	1927-	Prof.	DVM 1927 Iowa S.C.
J. D. Strickland	1939-1946	Asst.	M.S. - Texas A&M
N. C. Fine	1935-1955	Prof. & Asst. Dean	Ph.D. - Minn.
J. H. Baumgardner	1945-	Prof.	M.S. 1940 Texas Tech
D. L. Devin	1947-1949	Asst.	B.S. - -
C. A. O'Brien	1948 -	Assoc.	Ph.D. 1964 Texas A&M
K. L. Neeley	1948-1961	Prof.	M.S. 1942 Texas A&M
S. E. Anderson	1948-1962	Assoc.	M.S. 1951 Texas Tech
H. R. Burkhart	1948-1951	Asst.	M.S. - Texas A&M
H. L. Mathews	1948-1951	Assoc.	M.S. - Texas A&M
K. B. Turner	1948-	Assoc.	M.S. 1941 Okla. A&M
F. W. Boren	1951-1956	Asst.	M.S. - Kansas U.
W. H. Cloninger	1953-1956	Assoc.	Ph.D. - U. of Mo.
R. H. Black	1954-1956	Prof. & Head	Ph.D. 1953 W. Va. U.
H. R. Crookshank	1954-1959	Assoc.	Ph.D. 1951 Wisc.
F. A. Hudson	1960-	Assoc.	Ph.D. 1957 Oregon S.
D. W. Zinn	1961-	Prof. & Head	Ph.D. 1967 U. of Mo.
S. E. Curl	1963-	Assoc. & Asst. Dean	Ph.D. 1963 Tex. A&M
G. F. Ellis, Jr.	1964-1966	Prof. & Head	Ph.D. 1964 Tex. A&M
R. C. Albin	1964-	Assoc.	Ph.D. 1965 Neb.
R. D. Furr	1965-	Visiting Prof.	Ph.D. 1961 Okla.
B. B. Breidenstein	1966-68	Asst.	Ph.D. 1965 U. of Ill.
L. F. Tribble	1967-	Prof.	Ph.D. 1956 U. of Mo.
L. B. Sherrod	1967-	Visiting Prof.	Ph.D. 1964 Okla.
C. B. Ramsey	1968-	Assoc.	Ph.D. 1960 Ky.

While some of the original concepts still apply to the field of Animal Science, Animal Science today is a composite of several fields of specialization, each of which is constantly undergoing changes due to new concepts or improved techniques. For this reason, the curriculum for Animal Science students has been continually revised to provide for current and anticipated needs. The Department now supervises degree programs leading to the Bachelor of Science degree in Animal Business, Animal Production, or Animal Science, and the Master of Science in Animal Breeding, Animal Nutrition, and Meat Science. The Department of Animal Science also directs a program for Pre-Veterinarian Medicine.

Since the inception of the Department through 1967, 1,074 Bachelor of Science degrees and 58 Master of Science degrees have been conferred.

In addition to the instructional commitments of the Departmental staff, basic and applied research in Animal Science has become an established goal during the last decade. Staff members currently have 34 active research projects under investigation. In addition there are 18 preliminary investigations being conducted by various staff members. Many of these research projects are cooperative investigations with the personnel at Texas Technological College Research Farm and interdepartmental cooperative projects with the Department of Agricultural Engineering, Civil Engineering, and Agricultural Economics. Scientific and technical publications by the Departmental members are presented in Appendix I.

A summary tabulation of undergraduate enrollment is presented in Table 2. The steady increase in undergraduate enrollment in Animal Science at Texas Technological College indicates the importance of Animal Agriculture to the Southwest Region of the United States. In 1966-67 Texas Tech ranked 5th in undergraduate enrollment in Animal Science among the Land-grant Colleges and Universities in the United States.

Table 2

Summary Tabulation of Enrollment
Undergraduate

	Fall	Spring	Summer	
			1 SS	2 SS
1957-58	269	235	-	-
1958-59	260	226	-	-
1959-60	233	221	122	87
1960-61	243	229	51	44
1961-62	243	250	67	47
1962-63	264	256	80	57
1963-64	275	286	87	55
1964-65	314	309	89	62
1965-66	318	316	85	64
1966-67	328	321	86	64
1967-68	328	314	82	64

Summary Tabulation of the Departmental Budget for the past ten years including the full-time equivalants for staff and classified personnel is presented in Tables 3 and 4.

The major increase in the Departmental operations budget has been increases in staff salary and numbers of staff with only small increases in maintenance, equipment and travel funds.

As shown in Table 4 the total budget for herds and flocks operations has shown a decline during the past decade. The number of full-time equivalant personnel on the herds and flocks budget has decreased with only a slight increase in total salaries. Student assistants and part-time help has decreased to one-half that which was budgeted in 1957-58. In part, this decrease has been made up in private grants for research. However, this also reflects an increased efficiency in farm operations over the ten year period. The most critical area of herds and flocks operations is in maintenance, equipment and operations. There has been little if any change in the maintenance,

Table 3

Summary Tabulation of Budget, 1957-1967

Department of Animal Science

Year	Salaries FTE	Staff	FTE	Classified	Student Assistants and/or Part-time help	ME&T	Total
1957-58	7.35	$48,668	1	$3,200	$1,200	$5,150	$58,218
1958-59	7.35	51,969	1	3,200	1,200	5,150	61,519
1959-60	7.35	55,990	1	3,480	1.200	6,720	67,390
1960-61	7.1	52,516	1	3,600	1,700	6,500	64,316
1961-62	7.78	58,290	1	3,900	1,900	11,000	75,090
1962-63	6.78	60,848	1	4,080	1,900	9,400	76,228
1963-64	7.	77,250	2	7,800	2,200	12,150	99,400
1964-65	8.75	88,792	2	8,220	2,200	11,000	110,212
1965-66	9.75	112,469	2	8,640	2,500	11,500	135,109
1966-67	10.75	115,375	2	9,060	2,500	11,530	138,465

Table 4

Summary Tabulation of Budget, 1957-1967

Department of Animal Science Herds and Flocks

Year	Salaries FTE	Staff	FTE	Classified	Student Assistants and/or Part-time help	ME&T	Total
1957-58	1.65	$ 9,131	13.5	$42,655	$20,996	$86,032	$158,814
1958-59	1.65	9,131	13	40,540	18,111	74,400	142,182
1959-60	.85	9,234	12.5	44,760	21,111	71,500	146,605
1960-61	1.25	13,409	11	41,265	21,950	72,500	149,124
1961-62	.77	13,060	10.5	41,775	23,000	80,300	158,135
1962-63	1.47	13,646	9	36,520	29,860	80,300	160,326
1963-64	0	-0-	7.75	40,855	16,000	78,300	135,155
1964-65	.25	2,250	9	40,240	16,000	78,300	136,790
1965-66	.25	3,125	10.5	53,160	16,000	78,300	150,585
1966-67	.25	2,750	11.5	53,320	9,075	81,925	147,070

equipment, and operations budget over the past decade. This is reflected in the appearance of the farm at the present time. A majority of the fencing needs to be replaced, the irrigation wells need to be cleaned and the pumping equipment repaired, and the herds and flocks of cattle sheep and hogs need to be improved in quantity and quality of breeding stock. These items are reflected in Section III of this report of goals and objectives.

II. Summary statement of current Department status.

Table 5 presents the current enrollment of undergraduate and graduate students for 1967-68. The Texas Coordinating Board's report for the fall semester of 1967 is presented in Table 6.

Table 5

Current Enrollment of Undergraduate and Graduate Students (1967-68)

	Semester			
	Fall	Spring	1 SS	2 SS
Undergraduate	328	314	82	64
Graduate	22	20	11	10

Table 6

TCL Report, Fall 1967

		No. Courses	No. Laboratories
		29	17
	No. Students	331	294
Lower	Cr. Hours	993	-
	No. Students	428	87
Upper	Cr. Hours	1238	-
	No. Students	67	33
Graduate	Cr. Hours	179	-

The current Animal Science faculty consists of 15 individuals, of which 12 have earned the Doctorate degree. These are presented in Table 7 along with their date of appointment and current compensation for a nine months basis.

Table 8

Current Animal Science Faculty

Name	Rank	Highest Degree	Date of Appointment	F.T.E.	9 mo. Salary
Dale W. Zinn	Chair. & Prof.	Ph.D - Mo.1967	1961, 1967	1	$13,500
John H. Baumgardner	Prof.	MS- T.T. 1940	1945, 1961	1	10,900
Ralph M. Durham	Prof.	Ph.D.-Wisc.1951	1959	1	15,200
Richard D. Furr	Visit.Prof.	Ph.D.-Okla.1961	1965	-	-
Fred G. Harbaugh	Prof.	DVM - Iowa 1927	1927, 1941	1	13,875
Leland F. Tribble	Prof.	Ph.D.-Mo. 1956	1967	1	13,000
Robert C. Albin	Assoc. Prof.	Ph.D.-Neb.1965	1964, 1967	1	11,250
Samuel E. Curl	Assoc. Prof. & Asst.Dean	Ph.D.-Tex.A&M'63	1961, 1965	1	12,093
Frank A. Hudson	Assoc. Prof.	Ph.D.-Ore. 1957	1960, 1962	1	11,000
Coleman A. O'Brien	Assoc. Prof.	Ph.D.-Tex.A&M'64	1947, 1967	1	9,000
C. Boyd Ramsey[a]	Assoc. Prof.	Ph.D.-Ky. 1960	1968	1	13,500
Lloyd B. Sherrod	Visit.Assoc. Prof.	Ph.D.-Okla.1964	1967	-	-
Kirk B. Turner[b]	Assoc. Prof.	M.S.-Okla. 1941	1948, 1955	1	8,500
Blaine B. Breidenstein[c]	Asst. Prof.	Ph.D.-Ill.1965	1966	.75	9,525
Gary L. Gann[d]	Instructor	M.S.-T.T. 1968	1968	1	6,750
George F. Ellis, Jr.	Adjunct.Prof.	Ph.D.-Tex.A&M'64	1968	-	-

[a]Effective September 16, 1968.

[b]Attached to the Library.

[c]Resigned August 31, 1968.

[d]Effective September 1, 1968.

Departmental operations budget for the current year is presented in Table 8.

Table 8

Current Operating Budget

	Salaries				Student Assistants and/or		
	FTE Staff		FTE Classified		Part-time help	ME&T	Total
Departmental	10.75	$125,463	3.0	$11,760	$2,000	$13,900	$150,963
Herds & Flocks	0.25	3,050	11.75	56,760	8,000	77,255	145,065
High Plains Feed Research	0.25	2,733	1.80	5,460	12,450	37,357	59,000
Total	11.25	132,246	16.55	73,980	22,450	128,512	355,028

Departmental offices, classrooms and laboratories are located principally within two buildings on the campus. These are the Veterinary Science Building with 16,244 sq. ft. and the Meat Industries Laboratory with 8,486 sq. ft. In addition, the Nutrition Laboratory is located in the basement of the Agricultural Building, and consists of approximately 600 sq. ft.

The Department of Animal Science is responsible for the operational management of a 1,300 acre farm at Lubbock. In addition, the 13,800 acre Texas Technological College Research Farm at Pantex, Texas is extensively utilized in the department's teaching and research program. Cooperative research is also being conducted with the Post-Montgomery Estate Ranches, Levelland, Texas, and with MarTop Farms, Frisco, Texas. These facilities are utilized in beef cattle breeding and management research.

Approximately 3,000 acres of college controlled land is utilized in native pasture studies for range cattle and sheep production. The balance of the land is utilized in the production of crops (in cooperation with the Department of Agronomy) for maintaining the Department's flocks and herds.

Existing Facilities

Meat Industries Building. The Meat Industries Building contains a 50 seat classroom, slaughter area for swine, sheep, and cattle, cooler space, a cutting room, packaging area, four offices, a research laboratory, showers, lockers and restrooms. This facility is one of the finest to be found. We have oriented the departmental research program around the concept that the final product of animal production is the edible product available to the consumer. Therefore, the Meat Industries Building is the focal point of many research projects, not specifically under the meats option.

Approximately eleven Master's candidates have utilized this facility in one manner or another during the past year. The departmental teaching program in meats is also administered through this facility and approximately 330 students were involved in classwork and laboratory exercises during the fall semester, 1967-68.

Research Laboratories. There are two nutrition laboratories, one at Lubbock and one at Pantex. The equipment available in these labs allow for proximate analysis of meat and feedstuffs, calcium and phosphorous. Specific equipment includes: nitrogen analyzer, bomb calorimeter, colorimeter, Warburg respirometer, centrifuges, two vacuum ovens, two forced-air drying ovens, two Wiley mills, two Mettler balances and numerous smaller items and glassware.

The meats research laboratory contains a spectrophotometer, ether extraction apparatus, Mettler balance, centrifuge, Warner-Bratzler shear apparatus, and numerous items of glassware.

The physiology of reproduction laboratory includes eight microscopes, Mettler balance, colorimeter, drying ovens, and numerous surgical and analytical instruments.

The environmentally-controlled laboratory is currently under construction. The structure will allow study of all types of livestock and will greatly assist the proposed Doctorate program.

Animal digestion and metabolism laboratories are available at Lubbock and Pantex. Currently, cattle digestion work is being

conducted at Lubbock utilizing individual pens for eight animals. Four rumen fistulated steers and four esophageal fistulated steers are being used for digestion studies. Sheep digestion studies are being conducted at Pantex.

A small veterinary and bacterialogical laboratory is utilized for veterinary diagnostic work.

Pasture Studies. Native pastures are available for range sheep and cattle studies. At Lubbock, 320 acres of native grass and 50 acres improved pasture grasses are available, with the research farm at Pantex providing an additional 2,600 acres of native rangeland.

Large Animal Facilities. Beef cattle nutrition studies are conducted at Lubbock and in a 300 head capacity feedlot at Pantex. In addition, the Killgore Beef Cattle Center at Texas Technological College Research Farm provides feedlot space for conducting performance and nutrition research in beef cattle. Construction of additional feedlot facilities will have a combined capacity of 300 head and will be utilized in nutrition studies and in research on the utilization and disposal of organic feedlot wastes. The addition of these facilities will provide a total beef cattle feedlot capacity of over 1,200.

Drylot facilities for beef cattle management and reproduction studies are available at both locations. These have a total capacity of over 300 head.

Dairy facilities are more than adequate for anticipated programs in this area. These facilities will handle over 100 head of milking cows.

Poultry facilities are adequate for any anticipated program in this area. These include a 1,200 head capacity laying house with brooder and growing houses to match.

New facilities for horse management, breeding and nutrition studies are available and adequate to service this area.

Facilities are now under construction for teaching and research in sheep, goat, wool and mohair. The tie-in of these facilities with the recently expanded program in textile research at Texas Tech will enable the development of an outstanding program in wool and mohair research and technology.

Existing swine facilities are temporary, and permanent facilities must be constructed before the swine program can reach the stage of development warranted by its economic significance.

During the 1966-67 academic year, the following numbers of livestock were utilized in the departments teaching and research program.

Class	Campus Farm	TTCRF	Total
Beef cow breeding herds	136	397	533
Swine breeding herd	218	0	218
Sheep breeding herd	66	0	66
Goat breeding herd	20	0	20
Dairy breeding herd	53	0	53
Horses	24	0	24
Cattle nutrition research	1,063	733	1,796
Swine nutrition research	130	0	130
Sheep nutrition research	378	0	378
Cattle reproduction research	55	0	55
Sheep reproduction research	266	0	266
Poultry nutrition research	2,400	0	2,400

Meat Animal Carcass Evaluation (Meat Lab)

Beef 235

Pork 111

Lamb 56

Additional carcass data was obtained on approximately 600 cattle slaughtered at local packing companies.

Extension and Adult Activities.

Although funds are not available within the Department for Extension and Adult Education Activities, a considerable quantity of this is carried on by Departmental Staff members. Various members of the staff are utilized for speaking engagements to youth and adult groups throughout the state. In addition to this, the Department sponsors or co-sponsors public service conferences as follows:

1. Texas Technological College Research Farm Field Day (registered attendance - 200).
2. Texas Technological College Livestock Conference (registered attendance - 225).
3. Texas Technological College Swine Short Course (registered attendance - 290).
4. FFA Spring Contest Roundup (registered attendance - 1,400).
5. Four H District Elimination Contest (registered attendance - 250).

Research Activities.

Staff members within the Department of Animal Science are deeply involved in basic and applied research in problems that effect livestock and the meat industry. Research projects currently under investigation by Departmental members are as follows:

Current Research Investigations in the Department of Animal Science.

TTA-5-40 A Study of Shape as it is Related to Performance.
R. M. Durham.

TTA-5-42 Utilization of Plains Grown Sorghums and Cotton By-Products in the Feeding of Livestock.
R. C. Albin, R. M. Durham, F. G. Harbaugh, F. A. Hudson and D. W. Zinn.

TTA-5-44 Standard Versus Intensified Management Practices of Range Sheep for Optimum Wool and Fat Lamb Production.
F. A. Hudson, R. M. Durham, S. E. Curl, D. W. Zinn and R. D. Furr.

TTA-5-45 Preliminary Investigations in Animal Breeding, Animal Nutrition, Physiology and Meats.

1. Plastic Devices to Facilitate Semen Collection from Bulls, Rams and Billies.
   C. A. O'Brien.

2. Improved Procedure for Applying a Simplified Method for Semen Collection from Bulls, Rams and Billies by Electro-Ejaculation.
   C. A. O'Brien.

3. A Study of Various Environmental Factors Affecting Birth Weight and Survival Rate of Lambs in the West Texas - New Mexico Area.
   S. E. Curl and F. A. Hudson.

4. Rumen Inoculation with Selected Microflora on Feedlot Performance of Cattle and Sheep.
   R. M. Durham.

5. The Utilization of Milo in Poultry Rations as Influenced by Processing Method.
   R. C. Albin and D. W. Zinn.

6. The Utilization of Milo in Swine Rations as Influenced by Processing Method.
   R. C. Albin, B. B. Breidenstein and Dale W. Zinn.

7. Utilization of Milo in Cattle Rations as Influenced by Processing Method.
   D. W. Zinn, R. C. Albin and B. B. Breidenstein.

8. A Study of Drylot Management of Beef Cattle.
   R. M. Durham, D. W. Zinn and S. E. Curl.

TTA-5-46 Factors Affecting Carcass Merit and Palatability Characteristics of the Meat Animal.
D. W. Zinn, R. M. Durham, B. B. Breidenstein and G. L. Gann.

TTA-5-47 A Study of the Effects of Inhibition of Estrus in Feedlot Heifers Fed Melengestrol Acetate (MGA).
C. A. O'Brien.

TTA-5-49 A Study of Calf Crop Percentage in Range Cattle as Influenced by Various Management Factors.
S. E. Curl, T. Copeland, R. C. Albin and D. W. Zinn.

TTA-5-51 A Study of Lambing Percentage in Ewes as Influenced by Hormone Treatments Designed to Induce Multiple Pregnancy.
S. E. Curl, F. A. Hudson, R. M. Durham and A. D. Burson.

TTA-5-52 Use of Intravaginal Progestin to Synchronize the Estrous Cycle in Sheep.
S. E. Curl and F. A. Hudson.

TTA-5-53 Protein and Energy Balance in Rations for Beef Cattle.
R. C. Albin and D. W. Zinn.

TTA-5-54 Correlation of In Vitro vs. In Vivo Digestion and Animal Performance Utilizing an All-Concentrate Ration.
R. C. Albin and R. M. Durham.

TTA-5-55 The Net Energy of Milo for Production as Fed With and Without Roughage to Beef Steers.
R. C. Albin, D. W. Zinn, S. E. Curl and R. M. Durham.

TTA-5-56 Early Weaning of Calves.
R. C. Albin, S. E. Curl and D. W. Zinn.

TTA-5-58 Seasonal Diets of Beef Cattle on Native Range.
R. C. Albin, J. L. Schuster, D. W. Zinn and R. D. Furr.

TTA-5-60 Developmental Growth and Fattening of the Bovine.

1. Post-Weaning Physical and Chemical Composition.
   D. W. Zinn, R. C. Albin and S. E. Curl.

2. Post-Weaning Proteins and Gross Energy Composition.
   D. W. Zinn, R. C. Albin and S. E. Curl.

3. Effect of Energy Intake Upon Carcass Composition.
   R. C. Albin, D. W. Zinn and S. E. Curl.

4. The Relationship of Soluble Protein to Collagen in Pre- and Post-Natal Bovine Tissue.
   G. L. Gann, B. B. Breidenstein and D. W. Zinn.

5. Nutritional Effects on Post-Weaning Growth and Fattening.
D. W. Zinn, R. C. Albin, B. B. Breidenstein and R. D. Furr.

6. Interrelationships of Live Animal-Carcass Characteristics During Growth and Fattening.
K. R. Hansen, D. W. Zinn and B. B. Breidenstein.

7. Nutrient Composition and Palatability Characteristics as Influenced by Growth and Fattening.
D. W. Zinn, B. B. Breidenstein and R. C. Albin.

TTA-5-61 An Evaluation of Qualitative Carcass Characteristics of Performance Tested Beef Cattle.
D. W. Zinn, B. B. Breidenstein and R. D. Furr.

TTA-5-62 A Study of Relationships of the Endocrine System to Growth and Development of the Bovine.
S. E. Curl, Mary Fennell, D. W. Zinn and R. C. Albin.

TTA-5-63 An Investigation and Evaluation of the Brucellosis Eradication Program in the State of Texas.
D. W. Zinn, F. A. Hudson, F. G. Harbaugh, R. D. Furr and W. F. Williams.

TTA-5-64 Effect of Melengestrol Acetate (MGA) on Feedlot Performance, Wool Production, Carcass Quality, and Reproductive Physiology of Ewe Lambs.
C. A. O'Brien.

TTA-5-65 Solubility of Sarcoplasmic and Myofibrellar Proteins of Beef and Swine as Influenced by Age and Body Weight.
B. B. Breidenstein.

_____ Utilization of Castorbean Meal in Livestock Rations.
R. C. Albin and D. W. Zinn.

_____ Use of Synthetic Progestins to Synchronize the Estrus Cycle in Beef Cattle.
S. E. Curl.

_____ Effects of Oral and Implant Administration of Hormones in Fattening Cattle.
R. C. Albin.

_____ A Study of the Value of Milo Hominy Feed for Cattle Feeding.
R. M. Durham.

_____ Studies on the Use of Milo By-Products as Additives in All-Concentrate Growing Rations.
R. M. Durham.

_____ Investigations on the use of Mesquite and Other Materials for Ruminant Feeds.
R. M. Durham.

_____ A Study to Determine the Value of Tylosin in Control of Liver Abscesses in Fattening Cattle.
R. M. Durham.

_____ Physiological Effects of Low Levels of Air Moisture on Livestock.
S. E. Curl, W. Grub, L. F. Tribble and D. W. Zinn.

_____ An Evaluation of Feedlot Performance, Ration Digestibility, and Energy Retention with Steers Fed Different Types of Vacuum Sealed Grain Sorghum Ensilage.
L. B. Sherrod, R. D. Furr, D. W. Zinn and L. G. Finley.

_____ Supplementation of Sorghum Grains For Growing-Finishing Swine.
L. F. Tribble, R. C. Albin and B. B. Breidenstein.

_____ Effects of Ration and Season on Length, Grade, and Quality of Wool.
F. A. Hudson, R. C. Albin and D. W. Zinn.

TEXAS TECHNOLOGICAL COLLEGE RESEARCH FARM

TTA-8-2 Improvement of Beef Cattle Through Selection of Performance Tested and Progeny Tested Sires.
Keith Hansen, R. D. Furr, Dale W. Zinn and O. D. Butler.

TTA-8-6 A Comparison of the Performance of Beef Cattle Selected by Four Different Criteria.
Keith Hansen, R. D. Furr, Dale W. Zinn and O. D. Butler.

TTA-8-21 A Comparison of Antibiotics in an All-Concentrate Fattening Ration for Beef Cattle.
R. D. Furr and Dale W. Zinn.

TTA-8-22 Effect of Different Levels of Sulfur, Certain Trace-Minerals and Stilbestrol in Grain Sorghum Fattening Rations for Beef Cattle.
F. D. Furr.

TTA-8-23 A Comparison of Different Levels of Supplemental Protein, Copper, and Cobalt in Grain Sorghum Fattening Rations for Beef Cattle.
R. D. Furr.

TTA-8-24 Nitrogen and Mineral Content of Various Forage Sorghum Varieties and the Effect of Sulfur and Minor Elements on Yield and Nutritive Value of Native Grass Pasture in the High Plains of Texas.
D. F. Owen and R. D. Furr.

TTA-8-32 Cattle Preference and Production of Native and Interseeded Grasses of the Texas High Plains.
J. L. Schuster and R. D. Furr.

TTA-8-33 A Comparison of High Energy Feedlot Rations With and Without Ammoniated Ricehulls.
R. D. Furr and Dale W. Zinn.

_____ Effect of Different Sources of Supplemental Nitrogen in All-Concentrate Feedlot Rations With and Without Chlortetracycline.
R. D. Furr and Dale W. Zinn.

Funding of the Research Projects has been from the following sources:

1. Texas Technological College Research Farm Revolving Fund, $75,000.00.
2. Texas Technological College High Plains Feed Research, $59,000.00.
3. State Appropriated Research Funds, $12,323.00.
4. Private Grants, $60,000.00.

III. Objectives and Goals.

It is the objective of the Animal Science Department to continue direction of the undergraduate program toward meeting present and future needs of increasingly complex training, and to develop advanced studies for those who wish to specialize in or increase their knowledge in many of the specific fields related to animal production and consumption.

Total undergraduate enrollment in the Department has shown a 30% increase during the past 10 years. However, 70% of this increase has occurred during the past 5 years. This indication of accelerated undergraduate enrollment projects to 400 students in 1972-73 and 450 students by 1977-78.

The following proposals do not anticipate the necessity of altering the present administrative organization of the department. However, there is the need for developing effective cooperation between the various schools and Texas Tech Research Farm of the college in making necessary courses available for students at all levels and disciplines within the department.

Strengthening of the present Master of Science program is to be continued. It is desired to provide graduate study in wool and mohair technology in cooperation with Textile Engineering within five years. Advanced degree offering in Animal Science at the Ph. D. level have been requested. Certain facilities will be required prior to offering

the above degrees. It appears that these degrees can be offered only after considerable additional expenditure, particularly in the areas of nutrition and physiology of reproduction. The facilities for meat science have been started in the desired direction, and can be improved and expanded upon.

In fulfilling the above additions in degree offerings, the following staff members and offices will be necessary. Although emphasis is placed on research and graduate needs, these additional personnel will also be incorporated in increasing the effectiveness of undergraduate instruction.

A. Meat Science
   Ph. D. 1970.
   Ph. D. 1973.
   Full time technician.
B. Physiology of Reproduction
   Ph. D. 1971.
C. Nutrition
   Ph. D. 1970.
D. Full time secretary and 1 part time secretary for main Animal Science office, 1970. These are in addition to present setup.
E. Biometrician, Ph. D. at earliest date. This member could be made available through Dean's office, serving school of agriculture.
F. Bacteriologist in Biology Department available for 12 month consultation with Animal Science Staff.

The following research needs are projected:

A. Minimum of thirty graduate assistantships and fellowships with desk space. This is to be abetted by clarification of present policy on out-of-state tuition, and increased attractiveness for securing top-notch graduate students with adequate preparatory backgrounds. Encouragement of outstanding freshmen to enter and follow the animal science curriculum.

B. In addition to funds required for implementing needed research programs with regard to facilities, and equipment, it will be essential that expendable funds be appropirated for research projects in lieu of the present limitations of the exisiting revolving funds.

C. The following space requirements are necessary, many of which can be consolidated for use by several areas at the graduate level if strategically located.

1. Animal Science Building, housing administrative offices, staff and 30 graduate students, with following classrooms and laboratories:
   a. Analytical chemistry laboratory. (M, N, P. of R.)*
   b. Biochemistry laboratory (M, N, P. of R.)
   c. Microscopic laboratory (N, P. of R.)
   d. Bacteriology laboratory (M, N, P. of R.)
   e. Radioisotope laboratory (M, N, P. of R.)
   f. Histology laboratory (M, P. of R.)
   g. Physiology of Reproduction laboratory
   h. Operating room (P. of R.)
   i. Large animal holding room (N, P. of R.)
   j. Small animal holding room (N. P. of R.)
   k. Digestion stalls with complete apparatus for study of digestion and metabolism in sheep, cattle and swine.
   l. Physiology of Reproduction classroom.
   m. Nutrition classroom.
   n. Four general classrooms.
2. Expansion of present Meat Industries building to include:
   a. Three staff offices
   b. Manager's office

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* M = Meats, N = Nutrition, P. of R. = Physiology of Reproduction.

c. Secretary office
d. Graduate student office (6)
e. Storage space (400 sq. ft. minimum)
f. Teaching and research laboratory
g. Cooler space (500 sq. ft. minimum)
h. Additional classroom (minimum capacity of 25)

3. New facilities for swine are required to develop the academic and research program warranted by the economic significance of this industry in the Southwest.
4. Completion of sheep and goat facilities.
5. The college needs to obtain ownership or working control of a ranch for educational and research studies by the various departments in the School of Agricultural Sciences. This would also need an endowment of considerable proportions for maintenance and operations.

D. Laboratory equipment required will include that necessary to adequately equip previously listed laboratories and also include:
1. Semen freezing equipment
2. Ova culture apparatus
3. Photomicrography equipment

Increased effectiveness at the undergraduate and graduate level is dependent on the initiation of the following course proposals:

A. Meat Technology courses tailored for broader than Animal Science area (specifically Home Economics).
B. Meat course at undergraduate level providing fundamental knowledge of plant operation.
C. Industrial Management courses tailored toward providing background for feedlot and meat plant or nutrition management.
D. Counseling of Sales Management coursework in curriculum of Animal-Business majors.
E. Increased co-ordination between departments of Range Management and Animal Science.
F. Increased Veterinary school courses for Animal Science students.
G. Horsemanship courses in conjunction with Physical Education.

H. Expansion of statistical offerings. Departmental requirements specifically require courses in experimental design, population genetics as related to statistical theory, least squares analysis. These requirements could be satisfied by development of a statistical program coordinated between the Mathematics Department and Data Processing Center, provided that at least one year's sequence be developed on a non-mathematical basis for those only requiring a working knowledge of statistical procedures.

It is anticipated that short courses be developed in conjunction with continuing education. However, financial support would be an absolute necessity. Support is also needed for present extension services made available in the form of Livestock-Feeders Day programs and publication of bulletins, pamphlets, and booklets for distribution to the public.

Although no requests for housing or incorporation of full-time U.S.D.A., A.R.S. personnel have been mentioned, consideration should be left open for obtaining their presence and added effectiveness toward the undergraduate and graduate training programs.

Many of the above projections can be accelerated and improved upon by increasing co-operative programs and academic pursuits between the various schools of the college, especially at the graduate level.

APPENDIX

I. List of Publications for Animal Science faculty since inception of Department.

Dale W. Zinn

Zinn, D. W. and G. C. Anderson. 1955. The antithyrotoxic value of liver residue and fish solubles of the pig. J. Animal Sci. 14:1261.

Zinn, D. W. 1956. The effect of restricting the nutrient allowance on the carcass composition of swine. Masters Thesis, West Virginia University.

Zinn, D. W. 1959. Heritability of carcass traits in beef cattle. Twentieth Annual Feeder's Day, New Mexico State Univ. (Proceedings).

Holland, L. A., J. H. Knox, and D. W. Zinn. 1959. Breeding beef cattle for Southwestern ranges. W-1 Annual Report, New Mexico Agri. Exp. Sta., University Park, New Mexico.

Zinn, D. W., L. A. Holland and P. E. Neale. 1959. Genetic and evironmental studies of factors affecting carcass merit in sheep. W-61 Annual Report, New Mexico Agric. Expt. Sta., University Park, New Mexico.

Zinn, D. W., L. A. Holland and P. E. Neale. 1960. Genetic and environmental studies of factors affecting carcass merit in sheep. W-61 Second Annual Report, New Mexico Agric. Expt. Sta., University Park, N. M.

Holland, L. A., J. H. Knox, and D. W. Zinn. 1960. Breeding beef cattle for Southwestern ranges. W-1 Annual Report, New Mexico Agric. Expt. Sta., University Park, N. M.

Zinn, D. W. and W. A. Ljungdahl. 1960. Live animal evaluation factors affecting steer values. Fifth Annual Cattle Breeders' School, New Mexico State University pp. 4-6 (Proceedings).

Zinn, D. W. 1961. The effect of weaning age, breed, and sex on lamb carcass characteristics. Twenty-Second Annual Feeders' Day, New Mexico State University, (Proceedings).

Zinn, D. W. 1961. Cutting methods as related to lamb carcass evaluation. Proc. Reciprocal Meat Conference. 14:177.

Elliott, H., D. W. Zinn, and R. M. Durham. 1961. Streamlined hind-quarter for estimating cutout in beef cattle. J. Animal Sci. 20:905 (abstract).

Powell, D., W. L. Kent, H. Elliott and D. W. Zinn. 1961. Comparison of carcass traits of Angus and Hereford steers. J. Animal Sci. 20:910 (abstract).

Durham, R. M., H. Elliott and D. W. Zinn. 1961. Technique for marbling beef carcasses. J. Animal Sci. 20:916 (abstract).

Zinn, D. W., H. Elliott, D. Burnett and R. M. Durham. 1961. Evaluation of U.S.D.A. beef grading methods. J. Animal Sci. 20:922 (abstract).

Zinn, D. W., R. Stovall, J. E. Miller and R. M. Durham. 1962. The effects of length of time on feed on carcass conformation and grade of beef. J. Animal Sci. 21:986 (abstract).

Zinn, D. W. 1963. Recent advances in meat research as they effect the beef cattle producer. Texas Technological College Animal Husbandry Report No. 1.

Zinn, D. W. 1963. Meat research as a guide for the production of superior beef. Proceedings Second Annual Coordinated Beef Cattle Improvement Conference, University of Nebraska, Lincoln, Nebraska.

Zinn, D. W., T. H. Montgomery, Gladys Belcher and W. L. Kent. 1963. Effects of length of feeding period on fat deposition and tenderness in the beef carcass. J. Animal Sci., 22:830 (abstract)

Zinn, D. W., W. L. Kent, and L. Albin. 1963. Effects of length of feeding period on chemical constituents of beef muscle. J. Animal Sci. 22:830 (abstract).

Zinn, D. W., R. M. Durham, and R. Stovell. 1963. Muscle growth and development in the beef animal during the feeding period. J. Animal Sci. 22:829 (abstract).

Zinn, D. W., L. A. Holland, and P. E. Neale. 1963. Effect of weaning age on live animal and carcass measurements in lambs. J. Animal Sci. 22:829 (abstract).

Zinn, D. W., L. A. Holland, and P. E. Neale. 1963. Effect of breed and sex on live animal and carcass measurements in lambs. J. Animal Sci. 22:830 (abstract).

Zinn, D. W. 1963. Effect of age and length of feeding period on muscle growth, fat deposition and tenderness in the beef animal. Livestock and Feeder's Day, Texas Technological College (Proceedings).

Zinn, D. W. 1964. Interrelationships of live performance traits and quantitative and qualitative characteristics of beef carcasses. Proc. Reciprocal Meat Conference, 17, 43.

Zinn, D. W., R. C. Albin, S. E. Curl and C. T. Gaskins. 1965. Growth and fattening of the bovine. I. Post-weaning composition. J. Animal Sci. 24:592 (abstract).

Zinn, Dale W. 1965. The production of consumer acceptable lamb. Proc. Colo. State Univ. Feeder's Day. Fort Collins, Colo.

Zinn, Dale W. 1965. Factors influencing meat production in cattle. Proc. Colo. State Univ. Feeder's Day, Fort Collins, Colo.

Zinn, Dale W., Robert C. Albin, Sam E. Curl and Charles T. Gaskins. 1965. Growth and fattening of the bovine. I. Post-weaning composition. Proc. Western Sect., Am. Soc. Ani. Sci. 16:XXVII.

Hudson, F. A., R. M. Durham, F. G. Harbaugh, and D. W. Zinn. 1965. Drylot performance of ewes fed an all-concentrate ration. Proc. Western Sect., Am. Soc. Ani. Sci., 16:LXXI.

McBee, J. L., G. C. Anderson and D. W. Zinn. 1965. Carcass composition and growth performance of swine as affected by restricted nutrient allowance. W. Va. Agric. Expt. Sta. Bul. 513.

Zinn, Dale W., Robert C. Albin, Sam E. Curl and Charles T. Gaskins. 1966. Growth and fattening of the bovine. II. Post-weaning Composition. Crude Protein and Gross Energy. Proc. Western Sec., Am. Soc. Ani. Sci., 17:151.

Albin, R. C., D. W. Zinn, S. E. Curl and G. H. Tatsch. 1967. Growth and fattening of the bovine. III. Effect of energy intake upon carcass composition. J. Animal Sci. 26:209. (abstract).

Zinn, Dale W., Charles T. Gaskins and R. M. Durham. 1967. Effect of time on feed on tissue growth in the bovine. J. Animal Sci. 26:213 (abstract).

Zinn, D. W. and C. T. Gaskins. 1967. A factor analysis of beef carcass characteristics. J. Animal Sci., 26:213 (abstract).

Albin, Robert C., Dale W. Zinn and John E. Braden. 1967. Lysine $FeSO_4$, and cottonseed meal for growing-finishing swine. J. Animal Sci. 26:213 (abstract).

Curl, Sam E., Mary Fennell, Dale W. Zinn, and Robert C. Albin. 1967. Growth-endocrine relationships in the bovine. J. Animal Sci. 26:227 (abstract).

Carpenter, J. A., Jr., R. D. Furr, D. W. Zinn and O. D. Butler. 1967. A comparison of performance of beef cattle selected by four different criteria. International Center for Arid and Semi-Arid Land Studies Special Report No. 1:12.

Furr, R. D., J. A. Carpenter, Jr., and D. W. Zinn. 1967. Effect of different levels of sulphur, certain trace minerals and stilbestrol for beef cattle receiving high grain sorghum and finishing rations. International Center for Arid and Semi-Arid Land Studies Special Report No. 1:27.

Curl, S. E., Mary A. Fennell, D. W. Zinn, and R. C. Albin. 1967. Growth and Fattening of the Bovine. IV. Role of the endocrine system. International Center for Arid and Semi-Arid Land Studies Special Report No. 2:12.

Albin, R. C. and D. W. Zinn. 1967. Three methods of starting cattle on an all-concentrate ration. International Center for Arid and Semi-Arid Land Studies Special Report No. 2:29.

Zinn, D. W. 1967. Quantitative and qualitative beef carcass characteristics as influenced by time on feed. Ph. D. Dissertation. U. of Mo., Columbia.

Albin, R. C., F. G. Harbaugh, and D. W. Zinn. 1968. Castor meal of three ricin levels for cattle. J. Animal Sci. 27:288 (abstract).

Hansen, K. R., R. D. Furr, and D. W. Zinn. 1968. A comparison of performance of beef cattle selected by four different criteria. ICASALS Spec. Report No. 4:45.

McClung, J. E., R. C. Albin, J. L. Schuster, R. D. Furr, and D. W. Zinn. 1968. Summer diets of steers on deep hardland sites of the Texas High Plains. High Plains Texas Technological College Research Farm Reports, ICASALS Special Report N . 4:47.

Curl, S. E., Mary A. Fennell, D. W. Zinn and R. C. Albin. 1968. Growth and development of the bovine as related to certain encocrine factors. J. Animal Sci. 27:1011.

Zinn, D. W., C. T. Gaskins, G. L. Gann and H. B. Hedrick. 1968. Beef muscle tenderness as influenced by days on feed, sex, maturity, and anatomical location. J. Animal Sci. (Submitted)(ICASALS Cont. No. 40).

Zinn, D. W. R. M. Durham and H. B. Hedrick. 1968. Feedlot and carcass grade characteristics of steers and heifers as influenced by days on feed. J. Animal Sci. (Submitted) (ICASALS Cont. No. 39).

Zinn, D. W., C. T. Gaskins, and R. M. Durham. 1968. The growth of carcass tissues of steers and heifers as influenced by days on feed. J. Animal Sci. (Submitted) (ICASALS Cont. No. 41).

Zinn, D. W. 1968. The influence of animal growth and fattening upon feedlot management. Proc. Beef Cattle Conf. ICASALS Special Report No. 7:1.

Furr, R. D. and D. W. Zinn. 1968. Maximizing protein from livestock. Proc. Symp. on Increasing Food Production in Arid Lands. ICASALS Cont.

Albin, R. C., F. G. Harbaugh and D. W. Zinn. 1968. Utilization of castormeal in livestock rations. Proc. Beef Cattle Conf. ICASALS Sp. Report No. 7:23.

Curl, S. E. J. Wiginton, D. W. Zinn, R. C. Albin and B. B. Breidenstein. 1968. Influence of the thyroid and other endocrine factors on growth and fattening of steers on different rations. Proc. Beef Cattle Conf., ICASALS Special Report No. 7:43.

Curl, S. E., W. Durfey, R. Patterson and D. W. Zinn. 1968. Rate of norethandrolone release from subcutaneous implants in beef cattle. Proc. Beef Cattle Conf., ICASALS Special Report No. 7:51.

Albin, R. C., J. Jenkins and D. W. Zinn. 1968. The effect of oral and implant administration of hormones for fattening cattle. Proc. Beef Cattle Conf., ICASALS Special Report No. 7:61.

Hansen, K. R. and D. W. Zinn. 1968. Effect of feeding regime on production and carcass traits of light weight calves. J. Animal Sci. 27:1133. (abstract).

Curl, S. E., W. Durfey, R. Patterson and D. W. Zinn. 1968. Synchronization of estrus in cattle with subcutaneous implants. J. Animal Sci. 27:1189. (abstract).

I. List of Publications for Animal Science Faculty since inception of Department.

John H. Baumgardner

Baumgardner, John H. 1960. Advances in nutrition. Block and Bridle Club Yearbook. Vol. 1:29-30.

Baumgardner, John H. 1961. Principles of Livestock Feeding, First Edition. Third Revision, Rodgers Lithographers. Lubbock.

Baumgardner, John H. 1961. Let's improve grain sorghum. Block and Bridle Club Yearbook. Vol. 2:28.

Baumgardner, John H. and Chester C. Jaynes. 1962. Midland bermuda grass on the South Plains. Agronomy Report No. 1. Texas Technological College, Lubbock, Texas.

Baumgardner, John H. 1962. Western cattle feeding. Block and Bridle Club Yearbook. Vol. 2:29.

Baumgardner, John H. 1963. Western cattle feeding II, Block and Bridle Club Yearbook. Vol. 4:30.

O'Brien, C. A. and John H. Baumgardner. 1967. Effect of melengestrol acetate (MGA) on the reproductive physiology and feedlot performance of heifers II. J. Animal Sci. 26:229-30.

I. List of Publications for Animal Science faculty since inception of Department.

Ralph M. Durham

Durham, Ralph M., A. B. Chapman and R. H. Grummer. 1952. Inbred versus non inbred boars used in two sire herds on Wisconsin farms. J. Animal Sci. 11:1.

Durham, Ralph M. and J. H. Knox. 1953. Correlations between grades and gains of Hereford cattle at different stages of growth and between grades at different times. J. Animal Sci. 12:4.

Brown, L. O., R. M. Durham, E. Cobb and J. H. Knox. 1954. An analysis of the components of variance in calving intervals in a range herd of beef cattle. J. Animal Sci. 13:511.

Durham, Ralph M. and John H. Zeller. 1955. Using the probing technique in selecting breeding swine on farms. J. Animal Sci. 14:4.

Durham, Ralph M. and L. N. Hazel. 1957. Studies of buyer preference in purchasing boars of known merit. J. Animal Sci. 16:1048-1049.

Durham, Ralph M., C. Smith, A. W. Munson, E. L. Lasley, and E. A. Kline. 1957. The defatted ham as an indicator of hog carcass value. J. Animal Sci. 16:1072.

Durham, Ralph M., S. Osinska, and L. N. Hazel. 1958. An analysis of swine breed differences in size and shape of loin eye. Proc. Amer. Soc. Ani. Prod. 17:1136.

Durham, Ralph M., R. Willham, and L. N. Hazel. 1958. Biometrical aspects of feed consumption, gain and days on test in swine. Proc. Amer. Soc. Ani. Prod. 17:1138.

Elliott, Henry, R. C. Mowery, and R. M. Durham. 1960. Whole cottonseed and cottonseed meal in fattening lamb rations. J. Animal Sci. 19:4.

Koger, Tom, Henry Elliott, F. G. Harbaugh, and R. M. Durham. 1960. Sex effects on carcass productive traits in fattening beef calves. J. Animal Sci. 19:4(1238).

Powell, Dallas, J. Neill, J. H. Baumgardner, and R. M. Durham. 1960. Supplemental feeding of whole cottonseed and cottonseed meal to beef steers. J. Animal Sci. 19:4(1286).

Durham, Ralph M., Henry Elliott and Dale W. Zinn. 1961. Technique for marbling beef carcasses. J. Animal Sci. 20:916.

Elliott, R. Henry, Dale W. Zinn and Ralph M. Durham. 1961. Streamlined hindquarter for cutout in beef cattle. J. Animal Sci. 20:905.

Kent, Wendell, Dallas Powell, Ralph M. Durham and Frank Hudson. 1961. Comparison of different silages with and without implants for fattening cattle. J. Animal Sci. 20:938.

Zinn, D. W., R. Elliott, D. Burnett, and R. M. Durham. 1961. Evaluation of U.S.D.A. grading methods. J. Animal Sci. 20:922.

Durham, R. M., D. W. Zinn, and R. H. Elliott. 1962. Marblizing beef. Texas Tech Feeders Day, May 26, 1962.

Zinn, D. W., R. Stovell, J. C. Miller and R. M. Durham. 1962. The effects of length of time on feed on carcass conformation and grade of beef. J. Animal Sci. 21:4(986).

Zinn, D. W., R. Elliott, R. M. Durham, and H. Urban. 1962. The relationship of maturity and time in the feedlot on factors affecting carcass merit and palatability characteristics of the beef animal. Texas Tech Feeders Day, May 26, 1962.

Durham, R. M., F. G. Harbaugh, Robert Stovell and George F. Ellis, 1963. All-concentrate versus part roughage rations using milo as the grain for fattening cattle. J. Animal Sci. 22:3(835).

Durham, R. M., George F. Ellis and Robert Stovell. 1963. Studies on protein and energy levels in rations for young pregnant heifers in drylot. J. Animal Sci. 22:3(835).

Harbaugh, F. G., George F. Ellis, Ralph M. Durham and Robert Stovell. 1963. The effect of certain drugs and rations on ulcer formation and liver abscesses in fattening cattle. J. Animal Sci. 22:3(860).

Zinn, D. W., R. M. Durham, and R. Stovell. 1963. Muscle growth and development in the beef animal during the feeding period. J. Animal Sci. 22:3(829).

Thomas, Gerald W. and Ralph M. Durham. 1964. Drylot all-concentrate feeding - an approach to flexible ranching. J. Range Management, Vol. 17, No. 4, July, 1964.

Durham, Ralph M., Don McGinty, Fred Harbaugh, and Robert Stovell. 1966. A comparison of all-concentrate rations with high silage rations for fattening cattle. Texas Tech Feeders Day, pp. 21-24.

Ellis, G. F., Jr., R. M. Durham, F. G. Harbaugh and R. S. Stovell. 1966. Additives in all-concentrate milo rations for beef cattle. Texas Tech Feeders Day, pp. 15-20.

Durham, Ralph M., Fred Harbaugh, J. B. Pruett and Bobby Cude. 1966. Comparison of milo rations containing cottonseed hulls with milo rations containing no roughage and with or without aureomycin for fattening beef heifers. Texas Tech Feeders Day, pp. 21-24.

Durham, R. M., G. W. Thomas, R. C. Albin, L. G. Howe, S. E. Curl, and T. W. Box. 1966. Coprophagy and use of animal waste in livestock feeds. Management of Farm Animal Wastes (Proceedings National Symposium, May 5, 6 and 7, 1966, pp. 112-114).

Buchanan-Smith, Jock G., George F. Ellis, Jr., Ralph M. Durham, Robert C. Albin, and Lyle C. Kuhnley. 1966. Investigations of bacteria in the rumen of cattle on an all-concentrate diet compared to cattle on a high-roughage diet. Texas Tech Feeders Day, pp. 29-42.

Curl, Sam E., Stanley Westbrook, Dale W. Zinn, Frank Hudson, and Ralph M. Durham. 1966. Effect of a leg weighting technique on carcass development and feedlot performance of lambs. Proc. Livestock and Feeders Day. Texas Technological College. pp. 115-116.

Durham, R. M., G. W. Thomas, R. C. Albin, S. E. Curl, Larry Howe, and G. F. Ellis, Jr. 1966. Animal waste in livestock feeds and observations on coprophagy. Proc. Livestock and Feeders Day. Texas Technological College. pp. 103-106.

Ellis, Geroge F. Ellis, Jr., James A. Carpenter, Jr., and Ralph M. Durham. 1966. Popped milo in fattening rations for beef cattle. Proc. Western Sec. American Soc. of Animal Sci. Vol. 17. pp. 307-309.

Albin, Robert C., Gary H. Tatsch, Dale W. Zinn, Sam E. Curl, and Ralph M. Durham. 1966. The net energy for production (NEp) of sorghum milo. Proc. Livestock and Feeders Day. Texas Technological College. pp. 49-53.

Cole, H. H., (Editor) et al. Introduction to Livestock Production Including Dairy and Poultry. 1966. 2nd. Ed. W. H. Freeman and Company. San Francisco, U.S.A. and London, England.

Hudson, F. A., R. M. Durham and G. F. Ellis. 1966. All-concentrate milo-premix rations vs. 70-30 alfalfa-milo pellets for feeder lambs. Proc. Western Sec. American Soc. of Animal Sci. Vol. 17. pp. 229-230.

Durham, Ralph M., and J. B. Pruett. 1966. Effect of early high levels of zinc bacitracin on performance carcass traits and liver abscesses in steer cattle fed an all-concentrate ration. Proc. Western SEc. American Soc. of Animal Sci. Vol 17. pp. 295-297.

Durham, Ralph M., George F. Ellis, Jr., and Robert C. Albin. 1966. Milo-meal by-product and urea-aureomycin combinations in all-concentrate rations for beef cattle. Proc. Western Sec. American Soc. of Animal Sci. Vol. 17. pp. 289-292.

Durham. Ralph M., Luis Lopez and Robert C. Martin. 1967. Specific rumen inoculations in new feeder cattle being fed a specific all-concentrate ration. A.S.A.S. Vol.18 p.917. (Abstr.).

Durham, Ralph M. 1968. What about rumen inoculations? Feedstuffs. Vol. 40, No. 5. p. 38. February 3.

Durham, Ralph M. 1968. All-concentrate feeding. Feedstuffs. March 30. pp.26-28.

Ellis, Cotton and Ralph Durham. 1968. Maintaining cattle on ground mesquite wood. J. Animal Science. Vol. 27. No. 4. p. 1132. (Abstr.).

Durham, Ralph, Jim Rasberry and Barry Arndt. 1968. Restricted milo and part hominy rations with and without urea for growing calves. J. Animal Science. Vol. 27. No. 4. p. 1163. (abstr.).

Durham, Ralph and Troy Brasher. 1968. Value of hominy feed from corn and milo in all-concentrate cattle fattening rations. J. Animal Science. Vol. 27. No. 4. p. 1163. (Abstr.).

Powell, Dallas, Ralph Durham and Gary Gann. 1968. Liver abscess effects on performance traits in fattening beef cattle. J. Animal Science. Vol. 27. No. 4. p. 1174. (Abstr.)

Harbaugh, F. G., George F. Ellis and Ralph M. Durham. 1964. Ruminal ulcers and liver abscesses. Proc. S. W. and Rocky Mtn. Div. AAS. Read at the Sectional Meeting, AAS, Lubbock, Texas, April, 1964.

Nix, C. L., S. E. Curl, F. A. Hudson, R. M. Durham and F. G. Harbaugh. 1964. Hormone-induced superovulation and subsequent fertility in rambouillet ewes. Proc. S. W. and Rocky Mtn. Div. AAS. Read at the Sectional Meeting, AAS, Lubbock, Texas, April, 1964.

Howe, L. L., Ralph M. Durham and J. R. Stovell. 1964. Studies on coprophagy in farm animals. Proc. S. W. and Rocky Mts. Div. AAS. Read at the SNctional Meeting, AAS, Lubbock, Texas April,1964.

I. List of Publications for Animal Science faculty since inception of Department.

R. D. Furr

Furr, R. D., A. B. Nelson, George Waller, Jr., and W. D. Campbell. 1960. Effect of level of wintering fall-calving beef cows and replacement heifers. Oklahoma Agr. Expt. Sta. Misc. Publ. MP-57:117.

Furr, R. D., A. B. Nelson, G. R. Waller, Jr. and W. D. Campbell. 1961. Effect of level of wintering fall-calving beef cows and replacement heifers. Oklahoma Agr. Expt. Sta. Misc. Publ. MP-64:34.

Furr, R. D. and Harvey M. Vollrath. 1963. Feeding 4-H beef calves in Hawaii. Hawaii Coop. Ext. Ser. Club Cir. 175.

Furr, R. D. and K. K. Otagaki. 1963. Emergency feeding of livestock: beef cattle. Hawaii Coop. Ext. Ser. Cir. 401.

Nelson, A. E., L. R. Kuhlman, R. D. Furr, W. D. Campbell and G. R. Waller, Jr. 1963. Creep-feeding fall calves. Oklahoma Agri. Expt. Sta. Bul. B-610.

Nelson, A. B. and R. D. Furr. 1961. Effect of feeding cottonseed meal at intervals of two, four, and six days to yearling heifers grazing dry range grass. Oklahoma Ag. Expt. Sta. Misc. Publ. MP-64:34.

Nelson, A. B. and R. D. Furr. 1959. The value of aureomycin in wintering rations for heifer calves. Oklahoma Agr. Expt. Sta. Misc. Publ. MP-54:45.

Nelson, A. B. and R. D. Furr. 1960. Pelletted prairie hay for wintering calves. 1960. Oklahoma Agr. Expt. Sta. Misc. Publ. MP-57:94.

Furr, R. D. and A. B. Nelson. 1964. Effect of level of supplemental winter feed on calf weight and on milk production of fall-calving range beef cows. J. Animal Sci. 23:775.

Furr, R. D. and E. H. Cobb. 1964. Effects of stilbestrol implants on pasture gains of steers in Hawaii. Hawaii Agr. Expt. Sta. Tech. Prog. Rept. 141.

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Fred G. Harbaugh

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I. List of Publications for Animal Science faculty since inception of Department.

Robert C. Albin

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Ph. D. Dissertation. 1965. Factors contributing to the variation of urinary creatinine and creatinine-nitrogen ratios in beef cattle. University of Nebraska, Lincoln.

Anderson, S., R. Hamby, and R. C. Albin. 1961. Dryland milo versus irrigated milo in rations for finishing swine. J. Animal Sci. 40:923. (Abstr.)

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I. List of Publications for Animal Science faculty since inception of Department.

PUBLICATIONS
Samuel E. Curl

Curl, Samuel E. 1961. Dwarfism in Beef Cattle and the Influence of the Genes for Dwarfism on the Physiological Response to Hormone-Induced Stress. Master of Science Thesis. University of Missouri.

Curl, S. E., J. E. Comfort, and J. F. Lasley. 1961. Dwarfism in Beef Cattle and the Influence of Dwarfism Genes on Physiological Response to Hormone-Induced Stress. Missouri Agricultural Experiment Station Research Bull. 764.

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Curl, Sam E., Lynn Nix, Frank A. Hudson, and Ralph M. Durham. 1965. Hormone-Induced Multiple Birth in Rambouillet Ewes. J. Animal Sci. 24:589 (Abstr.).

Curl, Sam E., Lynn Nix, Frank A. Hudson, and Ralph M. Durham. 1965. Increased Fertility in Sheep Through Hormone Administration. I. Influence of Hormone-Induced Superovulation Prior to Mating on Lambing Percentage. Proc. of Ann. Meet., Western Sect., American Society of Animal Science, XVIII, Ft. Collins, Colorado; AH Research Rep. No. 3, Texas Tech. Col. Rep. on Agric. Industry.

Zinn, Dale W., Robert C. Albin, Sam E. Curl, and Charles T. Gaskins. 1965. Growth and Fattening of the Bovine. I. Post-Weaning Composition. J. Animal Sci. 24:592 (Abstr.); Proc. of Ann. Meet., Western Sect., American Society of Animal Science. XXVIII, Ft. Collins, Colorado; A.H. Research Rep. No. 5, Texas Tech. Col. Rep. on Agric. Industry.

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Durham, R. M., G. W. Thomas, R. C. Albin, L. G. Howe, S. E. Curl, and T. W. Bo[illegible]. 1966. Research on Coprophagy and the Use of Animal Waste in Livestock Feeds. Proc. of the Nat'l. Symposium on Animal Waste Management, East Lansing, Michigan. 1:94.

Curl, Sam E., Gregory Bogard, Tom Cockrell, and Frank A. Hudson. 1966. Synchronization of Estrus Through the Use of Intravaginal Progestin. Proc. Livestock and Feeders Day. Texas Technological College. pp. 117-122.

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Curl, Sam E., Tommy Buckner, Frank A. Hudson, and Robert C. Albin. 1966. Combined Effects of Synchronization of Estrus and Superovulation Prior to Mating on Reproductive Performance of Sheep. Proc. Livestock and Feeders Day. Texas Technological College. pp. 133-136.

Curl, Sam E., Lynn Nix, Frank A. Hudson, and Ralph M. Durham. 1966. A Study of Factors Affecting Birth Weight of Lambs and Effect of Birth Weight on Lamb Livability. Proc. Livestock and Feeders Day. Texas Technological College. pp. 137-139.

Curl, Sam E., Todd Oliver, Kenneth Otto, Robert C. Albin, and Tom Copeland. 1966. Calf Crop Percentage in Range Cattle as Influenced by Various Management Factors. I. Elimination of Barren Cows from the Breeding Herd Based on Rectal Diagnosis of Pregnancy. Proc. Livestock and Feeders Day. Texas Technological College. pp. 141-142.

Curl, Sam E. 1965. Synchronization of Estrus in Farm Animals. Block and Bridle Yearbook. Texas Technological College. pp. 25-27.

Curl, Sam E., Lynn Nix, Frank A. Hudson, and Ralph M. Durham. 1965. Hormone-Induced Multiple Birth in Rambouillet Ewes. J. Animal Sci. 24:589 (Abstr.).

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Curl, Sam E., Lynn Nix, Frank A. Hudson, and Ralph M. Durham. 1966. A Study of Factors Affecting Birth Weight of Lambs and Effect of Birth Weight on Lamb Livability. Proc. Livestock and Feeders Day. Texas Technological College. pp. 137-139.

Curl, Sam E., Todd Oliver, Kenneth Otto, Robert C. Albin, and Tom Copeland. 1966. Calf Crop Percentage in Range Cattle as Influenced by Various Management Factors. I. Elimination of Barren Cows from the Breeding Herd Based on Rectal Diagnosis of Pregnancy. Proc. Livestock and Feeders Day. Texas Technological College. pp. 141-142.

Curl, Sam E., Tom Cockrell, Greg Bogard, and Frank Hudson. 1966. Use of Intra-Vaginal Progestin to Synchronize Estrus in Sheep. J. Animal Sci. 25:921 (Abstr.).

Curl, Sam E., Stanley Westbrook, Dale W. Zinn, Frank Hudson, and Ralph M. Durham. 1966. Effect of a Leg Weighting Technique on Carcass Development and Feedlot Performance of Lambs. Proc. Livestock and Feeders Day. Texas Technological College. pp. 115-116.

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Curl, Sam E., Mary Fennell, Dale W. Zinn, and Robert C. Albin. 1967. Growth-Endocrine Relationships in the Bovine. J. Animal Sci. 26:227-228. (Abstr.); Proc. of Ann. Meet., Assoc. Southern Agr. Workers, New Orleans, La. p. 140.

Albin, Robert C., Dale W. Zinn, Sam E. Curl, and Gary H. Tatsch. 1967. Growth and Fattening of the Bovine. III. Effect of Energy Intake Upon Carcass Composition. J. Animal Sci. 26:209. (Abstr.); Proc. of Ann. Meet., Assoc. Southern Agr. Workers, New Orleans, La. p. 106.

Curl, Sam E. 1967. A New Technique for Regulating the Estrous Cycle in Sheep. Western Livestock Journal. January. pp. 103-106.

Curl, Sam E. 1967. (In Press). Improving the Reproductive Efficiency of Beef Cattle in the Southwest. Proc. of Ann. Livestock Conf. Texas Technological College.

Hudson, Frank A., Sam E. Curl, and Kenneth G. Otto. 1967. Propylene Glycol as a Possible Preventative of Pregnancy Toxemia in Ewes Fed Limited All-Concentrate Rations. Proc. Livestock and Feeders Day. Texas Technological College. pp. 1-3.

Albin, Robert C., Dale W. Zinn, and Sam E. Curl. 1967. Growth and Fattening of the Bovine III. Effect of Energy Intake Upon Carcass Composition. Proc. Livestock and Feeders Day. Texas Technological College. pp. 4-11.

Curl, Sam E., Mary A. Fennell, Dale W. Zinn, and Robert C. Albin. 1967. Growth and Development of the Bovine. IV. Role of the Endocrine System. Proc. Livestock and Feeders Day. Texas Technological College. pp. 12-21.

Gaskins, Charles T., Robert C. Albin, and Sam E. Curl. 1967. Use of All-Concentrate Rations for Early Weaning of Calves. Proc. Livestock and Feeders Day. Texas Technological College. pp. 35-37.

Curl, Sam E., A. D. Burson, William Stovell, Thomas Neely, and Frank A. Hudson. 1967. Intravaginal Synchronization of Estrus in Ewes Followed by PMS-Induced Superovulation. Proc. Livestock and Feeders Day. Texas Technological College. pp.59-69.

Curl, Sam E. 1967. Reproductive Performance of Ewes Superovulated During the Previous Year in Connection with Multiple Birth Experiments. Proc. Livestock and Feeders Day. Texas Technological College. pp. 73-77.

Curl, Sam E., A. D. Burson, William Stovell, and Frank A. Hudson. 1967. Effects of Intravaginal Progestin and PMS on Synchronization and Lambing Rate. J. Animal Sci. 26:942. (Abstr.)

Hudson, Frank A., Sam E. Curl, and K. G. Otto, Jr. 1967. Ovine Pregnancy Disease on All-Concentrate Rations with Propylene Glycol. J. Animal Sci. 26:921. (Abstr.)

Curl, Sam E., William Stovell, and Frank A. Hudson. 1968. Breed Effect on Ewe Response to Intravaginal Progestin-PMS. J. Animal Sci. 27:300 (Abstr.); Proc. of Ann. Meet., Assoc. Southern Agr. Workers, Louisville, Ky. p. 94.

Curl, Sam E., Lynn Nix, and Frank A. Hudson. 1968. Lambing Rate in Ewes as Influenced by Hormone-Induced Superovulation Prior to Mating. J. Animal Sci. 27:431-433.

Curl, Sam E., Mary A. Fennell, Dale W. Zinn, and Robert C. Albin. 1968. Growth and Development of the Bovine as Related to Certain Endocrine Factors. J. Animal Sci. 27:1011-1014.

Curl, Sam E., A. D. Burson, and Frank A. Hudson. 1968. (In Press). Synchronization of Estrus in Ewes Through the Intravaginal Administration of Flurogestone Acetate and PMS Administration on the Reproductive Performance of Ewes. J. Animal Sci.

Curl, Sam E., Alva D. Burson, and Frank A. Hudson. 1968. (In Press). Effects of Intravaginal Flurogestone Acetate and PMS Administration of the Reproductive Performance of Ewes. J. Animal Sci.

Curl, Sam E., William Durfey, Robert Patterson and Dale W. Zinn. 1968. Norethandrolone Release from Subcutaneous Implants in Cattle. J. Animal Sci. 27:1116. (Abstr.)

Curl, Sam E., William Durfey, Robert Patterson and Dale W. Zinn. 1968. Rate of Norethandrolone Absorption from Subcutaneous Implants in Cattle. Proc. of Ann. Meet., Western Sect., American Society of Animal Science, Moscow, Idaho. pp. 13-17.

Curl, Sam E., Jay Wiginton, Dale W. Zinn, Robert C. Albin and B. B. Breidenstein. 1968. Influence of the Thyroid and Other Endocrine Factors on Growth and Fattening of Steers on Different Rations. Proc. of Ann. Beef Cattle Conf. Texas Technological College. pp. 43-50.

Curl, Sam E., William Durfey, Robert Patterson and Dale W. Zinn. 1968. A New Method for Synchronization of Estrus in Cattle. Proc. of Ann. Beef Cattle Conf. Texas Technological College. pp. 56-60.

Curl, Sam E., William Durfey, Robert Patterson and Dale W. Zinn. 1968. Rate of Norethandrolone Release from Subcutaneous Implants in Beef Cattle. Proc. of Ann. Beef Cattle Conf. Texas Technological College. pp. 51-55.

Curl, Sam E., William Durfey, Robert Patterson and Dale W. Zinn. 1968. Synchronization of Estrus in Cattle with Subcutaneous Implants. J. Animal Sci. 27:1189. (Abstr.)

Curl, Sam E., and William Durfey. 1968. Response of Anestrous Ewes To Intravaginal Progestin-PMS. J. Animal Sci. 27:1189. (Abstr.)

I. List of Publications for Animal Science faculty since inception of Department.

Frank A. Hudson

Hudson, Frank A. 1953. Relationship of beef type to yield, percentage of wholesale cuts, and hide areas. M.S. Thesis, New Mexico State University.

Johnston, E. F., F. A. Hudson, R. Bogart, A. W. Oliver and F. F. McKenzie. 1956. The effects of injected testosterone on adult ewes. J. Animal Sci. 15:177.

Johnston, E. F., F. Hudson, R. Bogart, and J. Kaufmes. 1956. Retention of injected testosterone in the meat of adult ewes. J. Animal Sci. 15:185.

Hudson, F. A. 1957. Anesthesia time as a measure of body fat in genetically different groups of lambs. Ph. D. Thesis, Oregon State University.

Bogart, R., F. Hudson, H. Nicholson, R. W. Mason, and H. Krueger. 1958. Effect of injected testosterone on fertility in female cattle and sheep. Int. Journal Fertility. 3:105.

Hudson, F. A., J. D. Neill, and C. W. Cobb. 1961. Silage-milo rations for fattening lambs. Proc. 1961. Livestock Feeders Day.

Hudson, Frank A. 1962. Feeding lambs in West Texas. West Texas Chamber of Commerce Feeders Forum No. 3.

Hudson, F. A., R. M. Durham, F. G. Harbaugh, and D. W. Zinn. 1963. All-concentrate rations - sheep feeding. Proc. 1963. Livestock Feeders Day.

Hudson, F. A., R. M. Durham, and D. W. Zinn. 1963. Response to an all-concentrate ration by feeder lambs. J. Animal Sci. 22:837.

Hudson, Frank A. 1964. Intensified sheep management practices. Texas Technological College Research Farm Review.

Nix, C. L., S. E. Curl, R. M. Durham, F. A. Hudson, and F. G. Harbaugh. 1964. Hormone induced superovulation and subsequent fertility in Rambouillet ewes. J. Animal Sci. 23:911.

Nix, C. L., F. A. Hudson, S. E. Curl, and R. M. Durham. 1964. Lamb birth-weight as influenced by ration, sex, and type of birth; and effect of birth weight on early post-natal survival. J. Animal Sci. 23:911.

Curl, S. E., L. Nix, F. A. Hudson, and R. M. Durham. 1965. Hormone induced multiple birth in Rambouillet ewes. Proc. Western Section, Amer. Soc. of Animal Sci. 16:18.

Hudson, F. A., R. M. Durham, F. G. Harbaugh, and D. W. Zinn. 1965. Drylot performance of ewes fed an all-concentrate ration. Proc. Western Section, Amer. Soc. of Animal Sci. 16:71.

Hudson, Frank A. 1965. Cereal pasture versus drylot management of sheep. Texas Technological College Research Farm Review.

Hudson, F. A., R. M. Durham, and G. F. Ellis. 1966. All-concentrate milo-premix rations versus 70-30 alfalfa-milo pellets. Proc. Western Section, Amer. Soc. of Animal Sci. 17:229.

Curl, S. E., T. Cockrell, G. Bogard, and F. Hudson. 1966. Use of intravaginal progestin to synchronize estrus in sheep. J. Animal Sci. 25:921.

Hudson, F. A., R. M. Durham, F. G. Harbaugh, C. T. Gaskins, and D. W. Zinn. 1966. Drylot performance of ewes fed an all-concentrate ration. Proc. 1966. Livestock and Feeders Day. 1966:89.

Hudson, F. A., R. M. Durham, F. G. Harbaugh, D. W. Zinn, and G. F. Ellis. 1966. Response to all-concentrate rations by feeder lambs. Proc. 1966 Livestock and Feeders Day. 1966:93.

Hudson, Frank A., S. E. Curl and K. G. Otto. 1967. Ovine pregnancy disease on all-concentrate rations with propylene glycol. J. Animal Sci. 26:921.

I. List of Publications for Animal Science faculty since inception of Department.

Coleman A. O'Brien

O'Brien, Coleman. 1942. Instructions for Military Correspondence. Bluebonnet Ordnance Plant, U. S. Army Ordnance.

O'Brien, Coleman A. 1945. A study of the respiratory frequency and body temperature of swine as affected by environmental temperature. Master's Thesis. Texas A & M University.

O'Brien, Coleman A. 1961. A "new look" in meats. Block and Bridle Club Yearbook. Vol. 2:33-34.

Hupp, E. W., C. A. O'Brien, et al. 1963. Changes in peripheral blood of female goats following acute, fractionated or continuous gamma radiation. Radiation Research. 19:195-96.

O'Brien, C. A., et al. 1963. Simplified method for semen collection from rams and billies. Southwestern Veterinarian. 17:32-33.

O'Brien, C. A., et al. 1963. Multiple anomalies occurring in a newborn Spanish goat following prenatal gamma radiation. Nature 200. (No. 4909):906-07.

O'Brien, Coleman A., 1964. The effect of prenatal exposure to ionizing radiation on the development of the Spanish goat. Ph. D. Dissertation. Texas A & M University.

O'Brien, C. A., et al. 1964. The response of Spanish goats to prenatally administered gamma radiation. J. Animal Sci. 23:911-12. Read at Annual Meeting, Am. Soc. Ani. Sci., Knoxville, Tenn., August, 1964.

O'Brien, C. A., et al. 1964. Effects of gamma radiation upon Spanish goats irradiated in utero. Proceedings, S. W. and Rocky Mtn. Div., AAS. p. 37. Read at the Sectional Meeting, AAS, Lubbock, Texas, April, 1964.

O'Brien, C. A., et al. 1964. Radiation effects upon physiologic functions of goats. Proceedings, S. W. and Rocky Mtn. Div., AAS, p. 37. Read at the Sectional Meeting, AAAS, Lubbock, Texas, April, 1964.

O'Brien, C. A., et al. 1964. A simplified method for semen collection from rams and billies. The Year Book of Veterinary Medicine (Riley, Smith and Flynn, ed.) Vol. 2:124-5. Year Book Medical Publishers, Chicago.

O'Brien, C. A., et al. 1964. Abnormalities occurring in a Spanish goat exposed in utero to gamma radiation. Proceedings, S. W. and Rocky Mtn. Div., AAAS, p. 38. Read at the Sectional Meeting, AAAS, Lubbock, Texas., Apr., 1964.

O'Brien, C. A., et al. 1964. Multiple anomalies occurring in a newborn Spanish goat following prenatal gamma radiation. Nature, Lond. 200, 906-907 (Abstr. No. 1552, Vet. Bul. 34:229-230, 1964).

O'Brien, C. A. et al. 1964. Multiple anomalies occurring in a new-born Spanish goat following prenatal gamma-radiation. Nuc. Sci. Abstr. 18:681 (Abstr. 5066).

O'Brien, Coleman A. 1964. The effects of prenatal exposure to ionizing radiation on the development of the Spanish goat. Nuc. Sci. Abstr. 18:5556 (Abstr. 41212).

O'Brien, Coleman A. 1964. What is education? Block and Bridle Yearbook, Vol. 5:24.

O'Brien, C. A. 1965. Faster fertility testing by a simplified electro-ejaculator method. National Wool Grower. 55:(No. 5)15-17.

O'Brien, C. A. 1965. What are the opportunities in fertility testing of rams and billies. A. I. Digest 13:8-9.

O'Brien, C. A. 1965. Some economic advantages of fertility-testing sires. Sheep and Goat Raiser. 45(No. 9):22-23.

O'Brien, C. A. 1965. Physiologic phenomena observed in prenatally irradiated Spanish goats. J. Animal Sci. 24:926. Read at the Annual Meeting Am. Soc. Ani. Sci., East Lansing, Mich. Aug. 1965.

O'Brien, C. A. 1965. Effect of physical form of ration upon calculi formation and lamb performance. J. Animal Sci. 24:899. Read at the Annual Meeting, Am. Soc. Ani. Sci., East Lansing, Mich., Aug. 1965.

O'Brien, Coleman A., and A. F. McFee. 1965. Ram semen concentration by the photelectric method. UT-AEC Agricultural Research Laboratory in-service use tables, Oak Ridge and Knoxville, Tennessee.

O'Brien, Coleman A. 1965. Can we agriculturalists afford to neglect the humanities? Block and Bridle Club Yearbook, Vol. 6:23-24.

O'Brien, Coleman A. 1965. Recent developments in methods and equipment for fertility testing male sheep and goats. Paper presented at Golden Anniversary Annual Meeting, Texas Sheep and Goat Raisers Association, Austin, Texas, Dec. 2, 1965.

O'Brien, C. A., et al. 1966. The effects of prenatal gamma radiation on the reproductive physiology of the Spanish goat. Am. J. Vet. Res. 27:711-21.

O'Brien, Coleman A. 1966. The role of fertility testing flock sires on farms and ranches. Paper presented before The Sheep Selection Clinic, Fort Stockton, Texas, March 4, 1966.

O'Brien, Coleman A. 1966. Improved procedures for applying electronic stimuli to obtain semen collections from herd and flock sires. Texas Tech Feeder's Day Report, May 12, 1966.

O'Brien, Coleman A. 1966. Recent advances in devices for use in facilitating semen collection from herd and flock sires. Texas Tech Feeder's Day Report, May 12, 1966.

O'Brien, Coleman A. 1966. The effect of the physical form and method of processing feed upon the incidence of calculi and upon growth of feedlot lambs. Texas Tech Feeder's Day Report, May 12, 1966.

O'Brien, Coleman A. Current aspects of sire fertility. Paper presented, Texas Tech Feeder's Day, Lubbock, Texas, May 12, 1966.

O'Brien, Coleman A. 1966. New equipment for male fertility tests and artificial insemination. J. Animal Sci. 25:928. Read by title, Annual Meeting, Amer. Soc. Animal Sci., Rutgers University, New Brunswick, N. J., July 21-Aug. 4, 1966.

O'Brien, C. A. 1966. Plastic devices to facilitate semen collection by electro-ejaculation of bulls, rams and billies. Proc., 9th Internat'l. Congress of Ani. Prod., Edinburgh, Scotland. Aug. 11-18. Paper presented Aug. 13, 1966. Heriot-Watt University, Edinburgh, Scotland.

O'Brien, Coleman A. Clinical Animal Breeding. Collectro-flex Products Co., Lubbock, Texas. 175 pages. July, 1966.

O'Brien, Coleman A. 1967. Effect of melengestrol acetate (MGA) on the reproductive physiology and feedlot performance of ewe lambs. I. J. Animal Sci. 25:229.

O'Brien, Coleman A. 1967. Improved procedures for electro ejaculation of rams and billies. J. Animal Sci. 25:230.

O'Brien, Coleman A. et al. 1965. Simplified method for semen collection from rams and billies. An. Breed. Abstr. 33:96. (Abstr. 462).

O'Brien, C. A. et al. 1966. Effects of prenatal gamma radiation on the reproductive physiology of the Spanish goat. Vet. Bul. 36:675. (Abstr. 4130).

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O'Brien, Coleman. 1967. Endocrine pathology of reproduction in domestic animals. Proc., XVIIth World Vet. Congr. VII:154, Paris, General Report.

Hupp, E. W., C. A. O'Brien, H. B. Pace and J. W. Austin. 1967. Blood changes in female goats following different intensities of gamma radiation. Tex. J. Sci. 19:369-74.

O'Brien, Coleman A. and J. H. Baumgardner. 1967. Effect of melengestrol acetate (MGA) on the reproductive physiology and feedlot performance of heifers. II. J. Animal Sci. 26:229-30.

O'Brien, Coleman A. 1967. Improved procedures for electroejaculation of rams and billies. J. Animal Sci. 26:230.

O'Brien, Coleman A. 1967. Suppression of estrus in heifers with melengestrol acetate (MGA). Proc., 18th World Veterinary Congress, Paris, France.

O'Brien, Coleman A. and Charles F. Miller. 1967. Melengestrol acetate in the fattening lamb ration. I. Effect on weight gains, feed conversion, carcass characteristics and reproductive physiology (midsummer trial). Livestock and Feeders Day Report, Texas Tech. College, Lubbock.

O'Brien, Coleman A. et al. 1967. Inhibition of estrus in feedlot heifers with melengestrol acetate. I. Effect on weight gains, feed conversion, carcass and reproductive physiology (summer and fall). Livestock and Feeders Day Report, Texas Tech. College, Lubbock.

O'Brien, Coleman A. 1967. Progress in fertility testing herd and flock sires. Livestock and Feeders Day Report, Texas Tech. College, Lubbock.

O'Brien, Coleman A. 1967. Effect of melengestrol acetate (MGA) on the reproductive physiology and feedlot performance of ewe lambs. I. Proc. Southern Agri. Workers. New Orleans, La. p. 143.

O'Brien, Coleman A. 1967. Improved procedures for electroejaculation of rams and billies. Proc. Southern Agri. Workers, New Orleans, La. p. 144.

O'Brien, Coleman A. 1967. Discussions of papers and short-communications, No. 4:3. "Mucometritis in domestic animals", (July 20, 1967). 18th World Veterinary Congress, Paris, France.

O'Brien, Coleman A. 1967. Use of plastic funnels in sire fertility tests and clinical animal breeding. Southwestern Veterinarian 20:221-24.

O'Brien, C. A., C. F. Miller and W. C. Stovell. 1968. Response of ewe lambs to melengestrol acetate following induced puberty. J. Animal Sci. 27:302-3. (Abstr.).

O'Brien, C. A. and B. F. Arndt. 1968. Attempts at multiple fetation in heifers with oral progestational treatment. Beef Cattle Conf., Texas Technological College. ICASALS Spec. Report No. 7:70-71.

O'Brien, Coleman A. 1968. Auxiliary equipment for sire testing and A. I. The A. I. Digest 16:8-9, 19.

O'Brien, C. A., R. E. Bloss and E. F. Nicks. 1968. Effect of melengestrol acetate on the growth and reproductive physiology of fattening heifers. J. Animal Sci. 27:664-67.

O'Brien, C. A., C. F. Miller and W. C. Stovell. 1968. Response of ewe lambs to melengestrol acetate following induced puberty. Proc. Sou. Agr. Workers Ann. Conv., Louisville, Ky. pp. 96-97.

O'Brien, C. A. and B. F. Arndt. 1968. Attempts at multiple conception in heifers following variable term treatment with melengestrol acetate. J. Animal Sci. 27:1195.

Patents relating to sire fertility testing (Patents pending, 1966):
Plastic funnels to facilitate semen collection from rams, bulls, and billies.

A. Bovine model
B. Ovine - caprine model.

I. List of publications for Animal Science faculty since inception of Department.

Lloyd B. Sherrod

Sherrod, L. B. and A. D. Tillman. 1962. Effects of varying the processing temperatures upon the nutritive values for sheep of solvent-extracted soybean and cottonseed meals. J. Animal Sci. 21:901.

Sherrod, L. B. and A. D. Tillman. 1964. Further studies on the effects of different processing temperatures on the utilization of solvent-extracted cottonseed protein by sheep. J. Animal Sci. 23:310.

Furr, R. D. and L. B. Sherrod. 1965. Effects of supplemental feeding, stilbestrol, and vitamin A upon the performance of weanling steers on pasture, feedlot and carcass traits. Proc. Western Sec. Am. Soc. Animal Sci. 16:LXVI.

Sherrod, L. B., R. D. Furr, N. E. Nichols and C. W. Garcia. 1966. Supplemental vitamin A for beef cattle. Hawaii Agr. Exp. Sta. Circ. 64.

Sherrod, L. B., R. D. Furr, N. E. Nichols and C. W. Garcia. 1966. The effects of various supplemental feeding levels, stilbestrol implantation, and cobalt supplementation upon the performance of weanling steers on pasture, subsequent feedlot performance and arcass characteristics. Hawaii Agr. Ext. Misc. Publ. MP-31.

Danke, R. J., L. B. Sherrod, E. C. Nelson and A. D. Tillman. 1966. Effects of autoclaving and steaming of cottonseed meal for different lengths of time on nitrogen solubility and retention in sheep. J. Animal Sci. 25:181.

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I. . List of Publications for Animal Science faculty since inception of Department.

Blaine Blair Breidenstein

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George F. Ellis, Jr.

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Ellis, G. F., Jr., J. H. Jones and C. E. Van Doren. 1959. A sorghum ration with and without hormone implants. TAES Progress Report 2096.

Ellis, G. F., Jr. and J. H. JOnes. 1960. Response of steers to repeated implantation with stilbestrol. TAES Progress Report 2148.

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Albin, Robert C., George F. Ellis, Jr. 1966. Lysine supplementation to an all-concentrate ration. Proc. Texas Technological College Livestock and Feeders Day. p. 73.

Durham, Ralph M., George F. Ellis, Jr. and Robert C. Albin. 1966. Milo-meal by-product and urea-aureomycin combinations in all-concentrate rations for beef cattle. Proc. Texas Technological College Livestock and Feeders Day. p. 75.

Albin, Robert C., George F. Ellis, Jr. and Curtis Doyal. 1966. Use of milo meal in growing fattening swine rations. Proc. Texas Technological College Livestock and Feeders Day. p. 101.

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Durham, Ralph M., George F. Ellis, Jr. and Bobby Cude. 1967. Urea with oxytetracycline versus cottonseed meal with chlortracycline in all-concentrate rations for cattle. ICASALS Special Report No. 2. p. 22.

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DEPARTMENT OF

DAIRY INDUSTRY

HISTORICAL SUMMARY, PRESENT STATUS, AND FUTURE OBJECTIVES AND GOALS

DEPARTMENT DAIRY INDUSTRY

TEXAS TECHNOLOGICAL COLLEGE

HISTORICAL SUMMARY OF THE DEPARTMENT OF DAIRY INDUSTRY

Professor Kenneth M. Renner came to Texas Technological College in June 1927, and organized the Department of Dairy Products and Manufacturers as Associate Professor and Acting Head of the Department. The name was changed to the Department of Dairy Manufacturers in 1928, and Professor Renner was Head of the Department until his death September 2, 1947. Professor L. G. Harmon was made Acting Head until July 1948, when Dr. J. J. Willingham came to Texas Technological College as Professor and Head of the Department. The name was changed to Department of Dairy Industry January 23, 1954. Effective September 1, 1968, the name will be changed to Department of Dairy and Food Industry.

The Department has awarded 288 Bachelor of Science degrees and 20 Master of Science degrees. In addition, graduates of the Department have received 26 advanced degrees from other institutions: 12 Master of Science, 7 Doctor of Philosphy, 1 Doctor of Medicine, 1 Bachelor of Law, 1 Master of Business Administration, 2 Master of Education, 1 Doctor of Education, and 1 Doctor of Optometry.

The Department has offices, classrooms, and laboratories in the Agricultural Building and in addition has built and equipped, and presently maintains, the College Creamery.

INSTRUCTIONAL STAFF MEMBERS WITH RANK OF ASSISTANT PROFESSOR AND ABOVE

K. M. Renner, Associate Professor and Professor
M. G. Pederson, Assistant Professor and Associate Professor
L. G. Harmon, Associate Professor and Professor
J. J. Willingham. Professor
W. H. Tinney, Associate Professor
K. M. Renner, Assistant Professor
M. L. Peeples, Assistant Professor, Associate Professor, and Professor
R. M. Miller, Assistant Professor
E. R. Jarman, Assistant Professor

PUBLICATIONS OF FACULTY MEMBERS, DEPARTMENT OF DAIRY INDUSTRY

Professor K. M. Renner:

1. The Limit of Error of the Simplified Vacuum Solids Test as Applied to Ice Cream Mix, Evaporated and Sweetened Condensed Milk, L. G. Harmon, K. M. Renner, M. B. Harrison, and W. M. Slagle; Journal of Dairy Science, Vol. XXIV, July 1941, p. 265.

2. The Relationship of Cream Acidity to Mold Mycelia in Butter, H. H. Wilkowske, K. M. Renner, J. Q. Sealy, and W. M. Slagle; Journal of Dairy Science, Vol. XXVI, March 1943, p. 283.

J. J. Willingham:

1. A Study of the Bacterial Counts at Five Stages of Milk Processing, J. T. Cardwell, J. J. Willingham, E. L. McBride, and Don A. Marshall; Proceedings, Southern Association of Agricultural Workers, 1950.

2. A Study of Various Ingredients Used in the Manufacture of Vegetable Fat Frozen Desserts; M. L. Peeples, J. J. Willingham, J. O. Ashworth, and Joe Dennis, Proceedings, Southern Association of Agricultural Workers, February, 1955.

3. A Study of Lipolytic and Proteolytic Spoilage in Cottage Cheese; M. P. Rhodes, L. G. Harmon, J. J. Willingham, and Archie Leonard; Journal of Dairy Science, Vol. 37, 1954, p. 637.

4. Standard Proceedures for the Babcock Test for Milk, W. A. Cordes, J. E. Edmonson, T. I. Hedrick, E. R. Herreid, L. M. Lambert, J. J. Willingham, Burdet Heineman; Journal of Dairy Science, 37:761:1954.

5. The Effect of the Dairy Herd Ration upon the Susceptibility of Milk to Induced Hydrolytic Rancidity; W. B. Gilmore, J. J. Willingham, K. L. Neeley; Proceedings, Association Southern Agricultural Workers, Feb. 1968.

6. A Study of Selected Chemical and Physical Properties of High Solids Cultured Milks; John Jaynes, E. R. Jarman, J. J. Willingham, Proceedings Association of Southern Agricultural Workers, February, 1958.

7. The Influence of Rate and Temperature of Cooking on Acid Development in Making Cheddar Cheese from Pasteurized Milk; L. B. Barton, E. R. Jarman, J. J. Willingham, Journal of Dairy Science, 40:462:1957.

8. Survey of Dairy Products Judging Contests; C. J. Babcock, L. R. Dowd, E. L. Thomas, F. G. Warren, J. J. Willingham, G. M. Trout;

   (1). What Vocations Do Dairy Products Judging Contestants Follow after Graduation?; Journal of Dairy Science, 41:1823:1958.

   (2). What Salaries Do Dairy Products Judging Contestants Get after Graduation?; Journal of Dairy Science, 41:1826:1958.

   (3). Dairy Industry Training in Retrospect; Journal of Dairy Science, 42:715:1959.

9. Rate of Inoculum of Cottage Cheese and Its Influence on Yield and Manufacturing Time; J. N. Morgan, J. J. Willingham, Koy L. Neeley, J. W. Bennett, and E. R. Jarman; Journal of Dairy Science, 43:438:1960.

10. Test for Predicting the Shelf-life of Cottage Cheese; M. L. Peeples, J. J. Willingham, Journal of Dairy Science, 45:287:1962

11. An Evaluation of the CVT Test for Prediction of the Shelf-life of Selected Dairy Products; J. D. Edwards, M. L. Peeples, J. J. Willingham, Journal of Dairy Science, 1966.

Articles:

1. Food for the Gods - Chocolate Ice Cream, Ice Cream Field, October, 1963.

2. Technical Questions and Answers, Ice Cream Field, April, 1964.

3. Technical Questions and Answers, Ice Cream Field, October, 1964.

4. Technical Questions and Answers, Ice Cream Field, March, 1965.

5. Is There a Place for the Small Manufacturer?, Ice Cream Field, September, 1965.

Contributing Editor to Ice Cream Field Magazine.

M. L. Peeples

1. Relationship of Surface Tension to Variations in Composition and Temperature of Fluid Milk Products; Journal of Dairy Science, 44:972:1961

2. Simplified Nusselts-Type Equation for Determining Some of the Heat Transfer Characteristics of Fluid Dairy Products; Journal of Dairy Science, 45:286:1962

3. Test for Predicting Shelf-life of Cottage Cheese; Journal of Dairy Science, 45:287:1962

4. Forced Convection Heat Transfer Characteristics of Fluid Milk Products - A Review, Journal Diary Science, 45:297:1962.

5. Forced Convection Heat Transfer Characteristics of Fluid Milk Products. Journal Dairy Science, 45:303:1962.

6. Forced Convection Heat Transfer Characteristics of Fluid Milk Products during Cooling; Journal Dairy Science, 45:1456:1962

7. Simplified Nusselts-Type Equation for Describing Some of the Heat Transfer Characteristics of Fluid Dairy Products, Journal Dairy Science, 45:286:1962.

8. Values for the Heat Transfer Coefficients of Several Fluid Dairy Products; Journal Dairy Science, April, 1963.

9. Water Problems on the Dairy Farm, Sunbelt Dairyman, February, 1963.

10. Some of the Forced Convection Heat Transfer Characteristics of Condensed Milks, with R. J. Selman, Jr., Journal Dairy Science, 48:175:65.

11. A Simplified Method for Determining Sucrose Content of Frozen Desserts, Proceedings of Association of Agricultural Workers, 1965.

12. An Evaluation of the CVT Test for Prediction of the Shelf-life of Selected Dairy Products, with J. D. Edwards, Journal of Dairy Science, 1966.

13. Some Forced Convection Heat Transfer Characteristics of Ice Cream Mix. Journal of Dairy Science, 1966.

Articles:

1. Bacteria Can Break Your Back. The Sunbelt Dairyman, March, 1963

2. Rancid Milk Cuts Profits. The Sunbelt Dairyman, May, 1963

3. What Happens to Your Milk? The Sunbelt Dairyman, October, 1963

4. Butterfat - Effects of Management. The Sunbelt Dairyman, November, 1963

5. Mysteries of Milk. The Sunbelt Dairyman, January, 1964

6. Live and Let Live, with Pesticides. The Sunbelt Dairyman, May, 1964.

7. How to Treat for Mastitis. The Sunbelt Dairyman, October, 1964

8. Milk Ordinance and Code. The Sunbelt Dairyman, November, 1964

9. Training Young People in the Dairy Industry. The Sunbelt Dairyman, Dec.,1964.

10. Corrosion of Stainless Steel Equipment. Published by The Ohio State University, Department of Dairy Technology, Ext. Branch, 1959.

11. Types and Finishes of Stainless Steel. Published by The Ohio State University, Department of Dairy Technology, Ext. Branch, 1959

12. Some Rules of Thumb for Use in Considering the Efficiency of Dairy Plant Operations. Published by The Ohio State University, Department of Dairy Technology, Ext. Branch, 1959

R. M. Miller

1. The Development of a Jalapeno Pepper Flavored Pasteurized Processed Cheddar Cheese. Proceedings, Southern Association of Agricultural Workers, 1965.

2. The Effect of Monoglycerides on the Properties of Neufchatel and Creamed Cheese. Quarterly Bulletin of the Michigan Agricultural Experiment Station, Michigan State University, with C. M. Stine, and L. G. Harmon; Vol. 48, No. 2, p. 231-237; Nov. 1965.

3. Effect of Free Fatty Acids on Lactic Acid Production of a Streptococcus Lactis Culture; with H. L. Lewis, Proceedings Southern Association Agricultural Workers, 1968

DEPARTMENTAL ENROLLMENT SUMMARY

YEAR	UNDERGRADUATE MAJORS	GRADUATES
1958 - 59	43	2
1959 - 60	40	3
1960 - 61	26	2
1961 - 62	30	1
1962 - 63	23	3
1963 - 64	23	2
1964 - 65	19	3
1965 - 66	15	2
1966 - 67	21	2
1967 - 68	29	3

Enrollment in Elementary Course Dairy Industry 131 has increased from 125 in 1958 - 59 to 167 in 1967 - 68.

DEPARTMENTAL BUDGET SUMMARY

YEAR	SALARIES		M. E. & T.	STUDENT ASSISTANTS
	Teaching	Non-Teaching		
1958 - 59	$ 18,300	$ 3,000	$ 1,810	$ 500
1959 - 60	18,750	2,900	1,810	500
1960 - 61	21,233	3,000	2,000	500
1961 - 62	22,750	3,180	2,175	500
1962 - 63	25,450	3,180	2,400	600
1963 - 64	29,800	3,360	2,200	600
1964 - 65	31,100	3,540	2,200	600
1965 - 66	34,890	3,720	2,800	600
1966 - 67	36,355	3,900	2,800	600
1967 - 68	38,300	4,080	2,800	600

DEPARTMENTAL BUDGET SUMMARY - CREAMERY

YEAR	SALARIES	LABOR	SUPPLIES & MATERIAL	EQUIPMENT
1958 - 59	$ 8,000	$ 11,000	$ 73,300	$ 5,000
1959 - 60	10,450	12,000	68,300	8,500
1960 - 61	11,650	12,500	79,800	8,000
1961 - 62	13,077	12,200	82,000	10,000
1962 - 63	13,077	12,000	64,000	3,500
1963 - 64	10,142	12,000	64,000	2,000
1964 - 65	10,722	15,000	35,400	8,500
1965 - 66	11,443	15,000	34,000	12,000
1966 - 67	11,895	15,000	34,000	12,000
1967 - 68	13,753	17,500	44,000	12,400

SUMMARY CURRENT STATUS DEPARTMENT DAIRY INDUSTRY

During the 1967 - 68 academic year, the Departmental enrollment consisted of: 3 graduate students, 13 seniors, 6 juniors, 6 sophomores, and 3 freshmen. Enrollment in the elementary course was 167 students.

The Dairy Industry curriculum includes a fundamental course in the dairy and food industry for all Agricultural freshmen. The curriculum is designed to offer fundamental training in the science of the dairy and food industry. The technical courses in chemistry, bacteriology, testing, and the processing of milk and food products are designed to train the students for careers in the food industry. The graduates are prepared for college teaching and research, for industrial research with food plants, for superintendents and managers of all types of food operations, food products salesmen in the allied industries, technical control in food plants, for work in the regulartory field of state, local, national public health work. The curriculum permits electives to be taken in closely allied fields to prepare students for work in food plant office management, sales and advertising, and in field work for food organizations and food plants.

The College Creamery is operated as an education facility and is also operated on a commercial basis to the extent that the milk and ice cream for the College dormitories are processed in the College Creamery. The College Creamery is equipped with the latest equipment for processing milk and ice cream and has laboratory equipment for instruction in other phases of the dairy industry.

The present Dairy Industry faculty consists of the following:

Dr. J. J. Willingham, Professor and Chairman (12 months)	$ 17,200
Dr. M. L. Peeples, Professor (9 mos. teaching, 3 mos. research)	17,333
Mr. R. M. Miller, Assistant Professor (9 months)	8,100

The Department is presently using the following space: three offices for faculty members, two small office spaces for graduate students, office and reception room for secretary, and a small reading room.

Class rooms being used are:

Agriculture 126	Seating capacity 72
Agriculture 115	Seating capacity 40
Agriculture 117	Seating capacity 18

Laboratory space available for undergraduate instruction and research:

Agriculture 228	30' x 40'	1,200 sq. ft.
Agriculture 230	30' x 40'	1,200 sq. ft.
Agriculture 231	25' x 30'	750 sq. ft.
(This laboratory is badly overcrowded)		
Agriculture 229	18' x 15'	270 sq. ft.
(Used for glassware and chemical storage)		

In addition to these facilities, the Department has the College Creamery, an annex building 60' x 120', that is operated as an educational facility and also processes milk and ice cream for the College dormitories. The Creamery is equipped with small scale commercial equipment for processing milk and ice cream and laboratory type equipment for cheese and processed cheese making, butter and condensed milk processing equipment. There are cold storage rooms for milk and ice cream, dry storage area, and a refrigeration room. These facilities are used for undergraduate and graduate instruction and for research. The commercial operation uses student labor, thus providing additional student training.

Each year the Department sponsors a Dairy and Food Industry Conference for the people in the industry of the state and surrounding region in hopes that the people in the industry can be kept abreast of the problems, the development, the research findings, and the new items of interest in the dairy and food industry. Speakers at the Conference are from other colleges and from the industry of the nation. The Department receives excellent cooperation from the state and national dairy groups and from the industrial companies in the dairy and food industry.

The Departmental budget for the present year includes:

Teaching salaries	$ 38,300
Non-teaching	4,080
Maintenance, Travel, and Equipment	2,800
Student Assistants	600
Research	861

The College Creamery budget includes:

Salaries	$ 13,753
Student labor	17,500
Supplies, Material and Maintenance	44,000
Equipment	12,400

SUMMARY OF GOALS AND OBJECTIVES IN THE DEPARTMENT OF DAIRY INDUSTRY

The world food situation is serious with the demand for more and better food products and the preservation of foods being currently produced to feed the rapidly increasing world population.

There is a present critical need for trained personnel in the food industry. Employment services report that the food industries should furnish the best opportunities for trained personnel during the next few years.

With the shift in emphasis in the Department from milk and dairy products to all food products, the demand for trained personnel to meet the critical world food problem, the enrollment in the Department can logically be expected to increase. It is expected that undergraduate enrollment will increase to a minimum of 50 - 60 students in five years and 80 - 90 students in ten years. Graduate enrollment should increase to 12 - 15 in five years and 20 - 25 in ten years.

At present, the Department has underway seven research investigations with graduate students and research projects. It is planned to expand this to at least 15 in five years and 25 in ten years.

Faculty Personnel Needs

At present, the Department is greatly in need of at least one faculty member to assist in undergraduate and graduate instruction and assist with research. At least one additional faculty member will be needed in the next five years, and a third member in the next ten years.

Space Needs

Office space for the faculty members will be needed as they are employed. Office space for three graduate students is needed immediately and additional offices will be needed as graduate enrollment increases.

At present, for proper student instruction and research, there is a great need for a minimum of two laboratory rooms, 30' x 40', properly equipped for teaching and research. In the next five years, a minimum addition of the

above space will be needed and in the second five year period, this much more additional laboratory space will be needed. The above laboratory space will be needed due to expanded enrollment.

Additional Plans and Goals

1. Interdepartment Cooperation.

At present, the Department is cooperating with Food and Nutrition in the School of Home Economics in student training and research. Plans are under discussion to expand this to Animal Industries, Agricultural Economics, Agricultural Education, Agricultural Engineering, Horticulture, and eventually to other departments.

2. Additional Courses.

With the increased demand for improved processing methods and food preservation methods, it is planned to institute courses that would be of service to other departments and other schools, Business Administration, Arts and Science, and Home Economics. These courses could eliminate the duplication efforts in the field of food industries.

3. Food Science Institute.

Cooperate with all departments and agencies interested in the food industry to set up a Food Science Institute on campus for public service, student instruction, and research investigation.

4. Additional Funds.

Requests are being made and more will be made in the future to secure grants from government agencies, industrial corporations, and private donors for money for research including faculty salary, supplement equipment and materials. These grants can be of great help in securing faculty, graduate students, and undergraduate students.

5. Recruitment Procedures.

An active and dynamic program is needed to acquaint prospective undergraduate and graduate students with the opportunities offered by a career in the food industry. These prospective students should be given information regarding prospective employment opportunities, salaries paid, and other benefits, necessary training, and other pertinent information.

A definite program is also needed for proper faculty recruitment so that the best qualified personnel may be obtained.

6. Enlarge and Improve Present Graduate and Research Program.

To improve and strengthen the present graduate and research program, lecture and laboratory courses are needed with increased graduate enrollment. Organized courses can be taught for graduate students and with additional laboratory facilities the research projects can be enlarged and increased for better student training and research.

7. Food Processing Facilities.

The present facilities in the College Creamery are fairly adequate for student training in milk and milk products, but additional facilities are and will be needed.

With the increased emphasis on all foods, there is a critical need for facilities for the processing and preservation of other foods. These facilities will require additional space.

The foundation of the present Creamery building, 60' x 120', was constructed to carry a second story. The addition of this second story would provide additional space for offices, laboratories, and processing rooms.

The faculty and staff of the Department of Dairy Industry plan, if funds, space, and equipment can be secured, to develop an outstanding facility for training students for the food industry and to serve the public interest of the region, the state, and contribute to the easing of the world food problem.

DEPARTMENT OF
PARK ADMINISTRATION, HORTICULTURE
AND ENTOMOLOGY

A REPORT ON THE DEPARTMENT OF PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY

HISTORY - CURRENT STATUS - FUTURE PLANS

Professor Elo J. Urbanovsky, Chairman
September, 1968
Texas Technological College
Lubbock, Texas

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I. HISTORICAL SUMMARY

A. Origin and Development

1. Chronology of Departmental Status

The School of Agricultural Sciences has paralleled the growth of Texas Technological College. Organized in 1925, it offered courses for the future or the present-day farmer. Horticultural courses in plant propagation and orcharding were offered to acquaint the student with methods of farm beautification and productivity.

Two years later, in 1927, a Department of Horticulture was created as a result of an ever increasing demand; however, it was not until 1928 that the Department had its first administrative leader. The next significant development occurred in 1929 when the Horticulture Department combined with Genetics to form the Department of Horticulture and Genetics. Emphasis was placed on the genetics of both plants and animals.

In 1933, as a result of progress and a growing public awareness for the need of agriculturally trained personnel, the Department expanded to include the related fields of agronomy and field machinery. The Department was subsequently designated as the Department of Plant Industry. During this change, as numerous discoveries made genetics more of a basic science and less agriculturally oriented, a separate Department of Genetics was created in the School of Liberal Arts.

Horticulture continued as an academic section of the Plant Industry Department until 1951 when a separate department was created under the name of Park Management and Horticulture. In 1958, an entomology section was added to the

Department. The most recent change in the designation of the Department was in 1963 when the name, Park Administration, Horticulture and Entomology was adopted.

2. History of the Department

The history of the Department is reflected in the description of the programs, along with objectives of the Department in the College catalog. The following descriptions of departmental activities were obtained from the official catalog of the years indicated:

1928 - The Department of Horticulture offers instruction in the fundamental principles underlying horticulture. This comprises instruction in plant propagation, orcharding, floriculture, truck farming, ornamentals, and landscape design.

The fact that every farmer should have his own home garden and should beautify his own farm property is properly stressed.

Space for greenhouse instruction with the necessary laboratory equipment is available.

The beautification of the campus, which is underway, offers abundant instruction to the student in planning, planting, training, and identification of trees, shrubs, flowering shrubs, and flowering annuals and perennials.

The Department of Horticulture offers the basic fundamental work in genetics required of all agriculture students.

1929 - The Department of Horticulture and Genetics offers instruction in the basic principles underlying plant propagation, orcharding, olericulture, floriculture, ornamentals, and landscape architecture. The science of genetics is taught in this department, particularly stressing its application to plant and animal improvement. In addition to instruction in these special subjects, the curriculum offers work leading to a well-rounded education.

1933 - The Department of Plant Industry provides curricula leading to the degree of B.S. in Agriculture with major work in the fields of agronomy, farm machinery, and horticulture. Crops, soils, and range management options are offered in agronomy. General horticulture, pomology, floriculture, and landscape design options are offered in horticulture . . . .

1951 - The Department of Horticulture and Park Management offers training in basic horticultural subjects including plant propagation and selection of plant materials, olericulture, pomology, floriculture, landscape, gardening, park design, recreation area layouts, and park management. A large greenhouse area, plant propagation house, nursery, orchard, vegetable garden and hot beds and cold frames are maintained for instructional use in addition to the laboratories and classrooms. Training of students in commercial

vegetable crop production, floriculture, and park management are special objectives along with the general training in horticulture. The large campus area provides a wide variety of ornamental plant species for study and at the same time serves as a laboratory for landscape design and management problems which are common in recreational and park areas. The physical plant facilities of this department provide a means of starting plant materials from seed or cuttings and caring for these plants through all the steps of propagation and growing until they are finally planted in a suitable location on campus. The orchard facilities include different varieties of grapes, peaches, plums, apples, pears, cherries, and other fruits. The vegetable gardens are equipped with irrigation facilities and permit year-round growing of suitable species of vegetable crops.

1963 - The curriculum of the Department of Park Administration, Horticulture and Entomology offers optional programs in park administration, horticulture, and entomology. Students are thoroughly grounded in theoretical aspects of their field and through laboratory work and an in-service summer training program are given training in practical adaptation of principles. Graduates of any option have splendid opportunities in fields of teaching and research. Excellent laboratory and library facilities are available, and the nature of the region provides unusual opportunities for field studies.

The park administration option offers the student many opportunities in the relatively new field of landscape design and urban planning. Students may choose to specialize in any one of a wide variety of fields leading to stimulating and creative careers and enabling them to locate in one of many areas of the country.

The horticulture option allows the student to concentrate his work in this specialized plant science dealing with various problems related to the production of plants for economic and aesthetic use. Graduates in horticulture may choose careers with state and federal government agencies, with commercial firms in the field of plant production, in teaching, or they may go on to advanced study or research.

The entomology option enables students to specialize in the science dealing with insects and their relationship to other animals, man, and agriculture. The curriculum is designed to prepare students for careers in research, teaching, or insect control. Opportunities are available in such fields as state and federal experiment station work, public health services, plant quarantine, insecticide sales and development, state and federal extension work, pest control, and agricultural consultation. There are many opportunities for remunerative summer employment, and such work is considered an integral part of the entomology program.

A student may obtain a degree in the entomology program with an option in entomology by following the agricultural curriculum, or may specialize in entomology with a zoology major in the School of Arts and Sciences by taking 24 hours of entomology courses.

B. Undergraduate and Graduate Degrees Awarded, 1932-1968

Year	Park Administration		Horticulture		Entomology	
	Undergraduate	Graduate	Undergraduate	Graduate	Undergraduate	Graduate
1968	12		1	1	8	1
1967	22	2	9		6	
1966	35	1	7	1*	6	1
1965	15		4	1	6	
1964	15		1	1	2	
1963	12		4	5*	1	
1962	11		3		6	
1961	12		2		6	
1960	17		3		8	
1959	9		8		2	
1958	2		1		4	
1957	16		8		4	
1956	6		4		1	
1955			2	1		
1954			5			
1953			4			
1952			4	2*		
1951			4	1		
1950			6			
1949			5			
1948			2	1		
1947			1			
1946			0			
1945			0			
1944			0			
1943			0			
1942			4			
1941			4			
1940			2			
1939			7			
1938			3			
1937			2			
1936			2			
1935			2			
1934			1			
1933			3			
1932			2			

*Thesis topics in Park Administration or related field, a total of 8 Master's Degrees.

C. Instructional Staff

Professors

Present Members:

Ashdown, Donald, B.S., Ph.D.
Elle, George O., B.S., M.S., Ph.D.
Urbanovsky, Elo Joe, B.S., Chairman

Past Members:

Howell, Orville Brackett, B.S., M.S.
Leidigh, Arthur Henry, B.S., M.S.
Lynch, Goah Abe, B.S., M.S.
Mahoney, Charles Harold, B.S., M.S., Head (first horticulture professor)
Russell, Earnest Clive, B.S., M.S., Head
Strandtmann, R.W., B.S., M.S., Ph.D.
Yocum, Warren W., B.S., M.A., Ph.D.
Young, Wesley Arthur, B.S., M.S., Ph.D.

Associate Professors

Present Members:

Huddleston, Ellis Wright, B.S., M.S., Ph.D.
Kitchen, James William, B.S., M.S., Ph.D.
Tereshkovich, George, B.S., M.S., Ph.D.
Van Nierop, Emmanuel T., B.S., M.S., Ph.D.
Zukauckas, Edward William, B.S., M.S.

Past Members:

Ayers, Cecil Irvy, B.S., M.S.
Clay, Henry Pennock, B.S.
Morrow, Judd, B.S., M.S.
Rucker, Robert Henry, B.S., M.S.
Sullivan, Archie William, B.S., M.S.
Woodbury, George W., B.S., M.S.

Assistant Professors

Present Members:

Reed, Robert Rentoul, B.S.
Ward, Charles R., B.S., M.S., Ph.D.

Past Members:

Bell, Hershel McDonald, B.S.
Broderick, Harold J., B.S.

Past Members: (Continued)

Buie, Eugene Clay, B.S.
Burnett, Earl, B.S., M.S.
Duke, Taylor Earl, B.S.
Gosdin, William Marcus, B.S., M.S.
Hope, Claude E., B.S.
Mader, Ernest Lee, B.S., M.S.
Rydl, Glen, B.S., M.S., Ph.D.
Williams, Herman Frank, B.S., M.S.

Adjunct Professors

Present Members:

Doell, Charles E., B.S., M.S.
Houston, L.B., B.S.
Wirth, Conrad L., B.S.

D. Publications by Members of the Department

E. J. Urbanovsky, Chairman and Professor

Research on Parks; neighborhood, city, county, state and national parks.

Texas State Parks - A General Report of Functions, Space Requirements, Financial Considerations and Policies for the Future. Director of Project. August, 1963. p. 1-34.

A. S. L. A. Bulletin subjects, 1965.

Papers on planning, park organization, educational requirements, professional requirements, ethics, 1959-1963.

"The Social and Economic Impact of Open Space on the Land It Serves", paper given at Brighton, England to the Third World Congress of the Institute of Park and Recreation Administration, May, 1967.

The Sociological and Economic Impact of Urban Parks in Dallas, Texas. Director of Project. 1966.

El Camino Viejo . . . A South Central Texas Tourway. Director of Project. August, 1968.

Recreational, Scenic, and Historical Routes for South Central Texas. 16mm, sound, color, 30-minute film. Director of Project. 1968.

Recreation-Tourism Potential of the Trans-Pecos Region of West Texas. June, 1968.

Directed Thesis:

Charles Eatherly, 1963
Grady Manis, 1963
Paul Schlimper, 1963
Elner Thompson, 1963
Pat Bradley, 1963
Dan Kamp, 1966
Alden Sievers, 1967
Donald Stence, 1967

Consultant Activities:

Development of Master Site Plans for
Hardin Simmons College
Abilene Christian College
Prairie View A & M College

Dr. James W. Kitchen, Associate Professor

Some Factors Affecting the Oxalate Content of Spinach. Proceedings of Southern Agricultural Workers. p. 216. (J. W. Kitchen with E. E. Burns). 1964.

Calcium Oxalate Content of Spinach (Spinacia oleracea L.) Proceedings American Society Horticultural Science 84:441. (J. W. Kitchen, E. E. Burns, and B. A. Perry). 1964.

The Effects of Light Temperature and Ionic Balance on Oxalate Formation in Spinach. Proceedings of the American Society of Horticultural Science. 85: 465. (J. W. Kitchen, E. E. Burns, and R. Langston). 1964.

The Effect of Maturity on the Oxalate Content of Spinach (Spinacia oleracea L.) Paper presented at the 1964 National Institute of Food Technologists in April by Dr. Burns. Journal of Food Science. 30: 589-593. (J. W. Kitchen and E. E. Burns). 1965.

The Effect of Nutrition of the Plant on the Oxalate Content of Spinach (Spinacia oleracea L.) Abstracts of American Society of Horticultural Science. 61st Annual Meeting, No. 117. (J. W. Kitchen and E. E. Burns). 1964.

Sanitary Landfill Development. Parks and Recreation, p. 205. (J. W. Kitchen and D. Kamp). 1965.

Sanitary Landfills, Proceedings 19th Texas Turfgrass Conference. p. 39-42.

Sewage Effluent for Recreational Use. Park Maintenance, p. 18. February, 1966. (J.W. Kitchen and M. Z. Carter).

Sewage Effluent for Turf Irrigation, Proceedings of 1966 Technical Conference of the Sprinkler Irrigation Association. 1966.

Land Values Adjacent to an Urban Neighborhood Park. Land Economics. p. 357. (J.W. Kitchen and W. S. Hendon), 1967.

The Social and Economic Impact of Urban Parks in Dallas, Texas in 1966. Research Report. 1967. (W. S. Hendon, J. W. Kitchen, and B. M. Pringle).

Dallas Parks Survey - A Pilot Project Proceedings - Southwest Park and Recreation Training Institute. 1967. p. 87. (W. S. Hendon, J. W. Kitchen and B. M. Pringle).

Dr. Emmanuel T. Van Nierop, Associate Professor

"Evaluation of Several Organic Mulches on a Sandy Loam Forest Nursery Soil", Journal of Forestry, Vol. 56, No. 1, 1958.

"A County Natural Resources Survey-Water Resources", Rep. of the New York State Joint Legislative Committee on Revision of the Conservation Law, Leg. Doc., No. 11, pp. 32-46. (1961).

"Maple River Watershed", pamphlet published by Maple River Watershed Steering Com. 1965.

"Inventory-Private Outdoor Recreation Enterprises in Michigan", Summary of an Inventory completed by the State Soil Conservation Com. 1965.

"Water--Our Heritage", pamphlet prepared for public distribution at the request of State Committee for Michigan Week. 1966.

"Should We Fish and Boat on Our Reservoirs", The Conservationist, New York Conservation Department, Vol. 20, No. 2, 1965.

Potential for Outdoor Recreation Development in Clinton County, Michigan. Authored several chapters and served as member of Advisory Committee. A pilot project under direction of Soil Conservation Service, U. S. Department of Agriculture with assistance from Cooperative Extension Service, Michigan State University, Clinton County Soil Conservation District and other public agencies, 1967.

Potential for Outdoor Recreation Development in Ottawa County, Michigan. Idem.

"A Framework for the Multiple Use of Municipal Water Supply Areas", Water Resources Center, Ithaca, New York, 1967.

"Water Pollution--A National Disgrace", Prepared for Water Resources Com., Michigan Soil Conservation Districts.

"Catapult or Catalyst--Role of the Cooperative Extension Service in Michigan's Watershed Program", Paper presented at Extension Summer School in Natural Resources, Boyne Falls, Michigan. July 25-29, 1967.

Recreational Use of Municipal Reservoirs", Proceedings of Third Annual American Water Resources Conference, San Francisco, California. pp. 443-455, 1967.

Charles E. Doell, Adjunct Professor

Parks, Vol. II, Chapter IX, (L. H. Weir, editor). New York: A. S. Barnes and Company. 1928.

Public Park Policies. (Co-authored with Paul J. Thompson). Privately published, 1932.

A Brief History of Parks and Recreation in the United States. (Co-Authored with Gerald B. Fitzgerald), Chicago: Athletic Institute, 1954.

Elements of Park and Recreation Administration, Minneapolis: Burgess Publishing Company, 1963.

"The Preservation of Lakes and Streams in Metropolitan Areas", Paper presented at annual national convention, the Izaak Walton League, Minneapolis, June 17, 1960.

Park and Recreation Studies for Cities and Villages in Minnesota since 1960 in collaboration with Robert Corwine of Minneapolis and others: Columbia Heights, 1960; Hopkins, 1960; St. Louis Park, 1960; Robbinsdale, 1960; Bloomington, 1963; St. Cloud, 1963.

Texas State Parks--A General Report of Functions, Space Requirements, Financial Considerations and Policies for the Future. Consultant for the research project conducted at Texas Technological College in cooperation with the Texas State Parks Board, August, 1963.

Atlanta Metropolitan Region Comprehensive Plan, Nature Preserve Report, Recreation Consultant to Atlanta, Georgia Region Metropolitan Planning Commission, December, 1963.

"Broadening the Horizon", Keynote address, Southwest District Conference, National Recreation Association, Dallas, Texas, April 1, 1964.

"A Continuing Education Course in Parks and Recreation as a Government Recreation Service", An approach to a unified national service at all levels of government. Prepared at request of American Institute of Park Executives, December, 1964.

"Recreation as a Resource", Paper prepared from lectures at Michigan State University and Texas Technological College. 1966.

The Sociological and Economic Impact of Urban Parks in Dallas, Texas, in 1966. Consultant to Texas Technological College, research group, 1966.

"Elements of Land Acquisition", paper prepared from lectures at Michigan State University, Fall, 1966.

El Camino Viejo . . . . A South Central Texas Tourway. Consultant to the Texas Technological College research group, 1968.

Charles E. Doell (Continued)

Five Year Plan: Hennepin County (Minnesota) Park Reserve District. Consultant to the District since 1959.

"The Significance of Real Estate Appraisals in Determining Price of Park Reserve Lands", Consultant to Hennepin County Park Reserve District (Minnesota). Paper prepared to clarify the District's position in acquisition of park properties.

George Tereshkovich, Associate Professor

1. Tereshkovich, G. and A.H. Dempsey, 1956. Vegetable variety trials. Ag. Res. Briefs. Vol. 2. No. 5.

2. Tereshkovich, G. and A.H. Dempsey, 1957. Vegetable variety trials. Ag. Res. Briefs. Vol. 3. No. 6.

3. Tereshkovich, G., B. B. Brantley, and A.J. Dempsey. 1957. Tomato varieties for middle Georgia. Ga. Exp. Sta. Mimeo Series N.S. 42.

4. Tereshkovich, G., A.H. Dempsey, and B. B. Brantley. 1957. Sweet corn varieties for middle Georgia. Ga. Exp. Sta. Mimeo Series N.S. 43.

5. Dempsey, A.H. and G. Tereshkovich. 1957. Georgia pimiento picture. Ga. Exp. Sta. Misc. Paper. July.

6. Dempsey, A.H. and G. Tereshkovich. 1958. Rev. Growing pimientos. Ga. Exp. Sta. Press Bul. 269.

7. Tereshkovich, G., B.B. Brantley, and A.H. Dempsey. 1958. Miscellaneous vegetable variety trials: Cucumbers, Lima Beans, Green Beans. Ga. Exp. Sta. Mimeo Series. N.S. 51.

8. Tereshkovich, G. 1958. Vegetable variety trials. Ag. Res. Briefs. Vol. 4. No. 6.

9. Tereshkovich, G. 1960. Rev. Performance of rose varieties in central Georgia. Ga. Exp. Sta. Mimeo Series. N.S. 30.

10. Tereshkovich, G. 1963. Some factors affecting the keeping quality of sweet potato roots. Dissertation Abstracts 24:2211.

11. Tereshkovich, G. and D. W. Newsom. 1963. Identification of some fatty acids in periderm tissue of the sweet potato. Proc. Assoc. Sou. Agr. Workers 60: 244-245.

12. Tereshkovich, G. and D. W. Newsom. 1963. Some effects of date of washing and grading on keeping quality of the sweet potato. Proc. Assoc. Sou. Agr. Workers 60: 249-250.

13. Tereshkovich, G. 1963. Winter of 62-63 was severe test for roses. Ga. Agr. Res. Vol. 5. No. 1.

14. Tereshkovich, G. 1964. Bell pepper variety trials. Ga. Exp. Sta. Mimeo Series N.S. 1964.

*15. Tereshkovich, G. and D.W. Newsom. 1964. The effects of storage and recuring on the development of periderm tissue in several sweet potato varieties. Proc. Amer. Soc. Hort. Sci. 85: 434-440.

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*Journal Articles

George Tereshkovich (Continued)

16. Tereshkovich, G. 1965. New rose varieties for central Georgia. Ga. Agr. Res. Vol. 6. No. 3.

17. Tereshkovich, G. 1965. Lima bean performance trials in the Georgia Piedmont 1958-1960 and 1964. Ga. Exp. Sta. Mimeo Series N.S. 228.

18. Tereshkovich, G. and B.B. Brantley. 1965. Tomato performance trials in the Georgia Piedmont 1958-1964. Ga. Exp. Sta. Mimeo Series N.S. 229.

19. Tereshkovich, G. and B.B. Brantley. 1965. Green snap bean performance trials in the Georgia Piedmont. 1959-1964. Ga. Exp. Sta. Mimeo Series. N.S. 230.

20. Tereshkovich, G. and B.B. Brantley. 1965. Sweet corn performance trials in the Georgia Piedmont 1958-1964. Ga. Exp. Sta. Mimeo Series N.S. 231.

*21. Tereshkovich, G. and D.W. Newsom. 1965. Some effects of date of washing and grading on keeping quality of sweet potatoes. Proc. Amer. Soc. Hort. Sci. 86: 538-541.

22. Tereshkovich, G. 1966. An evaluation of summer squash in the Georgia Piedmont. Ga. Agr. Exp. Sta. Cir. N.S. 44.

23. Tereshkovich, G. 1966. Miscellaneous vegetable performance trials in the Georgia Piedmont: Cabbage, Collards, Kale, Spinach, Ga. Exp. Sta. Mimeo Series N.S. 252.

24. Tereshkovich, G. 1966. Brocolli performance trials in the Georgia Piedmont. Ga. Agr. Exp. Sta. Cir. N.S. 46.

*25. Tereshkovich, G. 1966. The effect of spacing and cutting of turnip greens on the yield and size of purple top white globe turnip roots. Proc. Amer. Soc. Hort. Sci. 89: 594-596.

26. Tereshkovich, G. 1967. Roses for the Georgia Piedmont. Ga. Agr. Exp. Sta. Res. Bul. No. 11.

27. Tereshkovich, G. 1967. Direct seeding of kale as a late-spring crop for Georgia Piedmont. Ga. Agr. Res. Vol. 8 No. 3

28. Tereshkovich, G. 1968. Yield and physical characteristics of several vegetable crops grown in the Georgia Piedmont. Ga. Agr. Exp. Sta. Res. Rept. No. 22.

*29. Tereshkovich, G. 1968. The effect of direct seeding and late-spring planting on yield of kale in Georgia. Hort. Sci. Vol. 3(1):38.

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*Journal Articles

George Tereshkovich (Continued)

Popular Articles

1. Tereshkovich, G. 1958. Plan, plant fall garden: Use these varieties. The Georgia Farmer. August.

2. Tereshkovich, G. 1959. These vegetable varieties. The Georgia Farmer. March.

3. Tereshkovich, G. 1965. Georgia Experiment Station rose trial garden. American Rose Magazine. Vol. 18. No. 11:11.

4. Tereshkovich, G. 1967. Roses for the home in the Georgia Piedmont. Georgia Hort. Soc. Vol. 3. No. 9.

E. W. Zukauckas, Jr., Associate Professor

Chrysanthemum Trial Report, each year.

Annual Trial Report, three years.

Perennial Plant Performance Report, two years.

1500 Words per week, nine years, Newspaper column.

National Chrysanthemum Society Bulletin.

Agricultural Industry Report.

Robert R. Reed, Assistant Professor

"West Texas Vegetable Growers Newsletter", Volumes 1-5, 1963-1967.

"Sweet Corn Studies on the High Plains", Agriculture Industry Report, 1963.

"Herbicidal Characteristics of Several Coded Compounds Under Furrow Irrigation in a Semi-Arid Climate", Proceedings of the Southern Annual Weed Conference, 1968.

"The Effect of TOK E-25 as an Herbicide on Six Different Vegetable Crops Under a Semi-Arid Climate", Proceedings of the Southern Annual Weed Conference, 1968.

Dr. Donald Ashdown, Professor of Entomology

1. Afansiev. Mike, and Donald Ashdown. 1951. The Pine Tip Moth. Oklahoma A & M College Bulletin B. 377. pp. 1-8.

2. Ashdown, Donald, and H. B. Cordner. 1952. Some Effects on Insect Control and Plant Response of a Systemic Insecticide Applied as a Spray, a Seed Treatment of a Soil Treatment. Journal of Economic Entomology. Vol. 45. pp. 302-307.

3. Ashdown, Donald, R. G. Dahms, W. O. Ridgeway, and C. F. Stiles. 1952. Hazards in the Use of Parathion for Greenbug Control. Journal of Economic Entomology. Vol. 45. pp. 82-84.

4. Ashdown, Donald, and Ellis W. Huddleston. 1961. "Greenbug Control in West Texas." Reports on Agricultural Industry. Texas Technological College. 2:5.

5. Carlo, C. P., Donald Ashdown, and V. G. Heller. 1952. The Persistance of Parathion, Toxaphene and Methoxychlor in Soil. Oklahoma A & M Tech Bulletin T-42. pp. 1-5.

6. Daniels, N.E., H.L. Chada, Donald Ashdown, and E. A. Cleveland. 1956. Greenbugs and Some Other Pests of Small Grains. Texas Agricultural Experimental Station Bulletin 845. pp. 1-13.

7. Box, T.A., Ellis W. Huddleston, Donald Ashdown, and Tom Copeland. 1962. "Biological Die-Off of Perennial Broomweed." Reports on Agricultural Industry. Texas Technological College. 3:1-2.

8. Huddleston, E.W., Donald Ashdown, Charles R. Ward, and Darrell Morris. 1962. Multipurpose Modification of Playa Sinks. "Section on Biology," Project Number 29, Division of Water Supply and Pollution Control, U.S.P.H.S, First Annual Report. 1-123.

9. Huddleston, E. W., Donald Ashdown, and Bruce Maunder. 1963. "Control of the Sorghum Midge, Preliminary Studies." Reports on Agricultural Industry. Texas Technological College. 4:1-2.

10. Huddleston, E. W., Donald Ashdown, Charles R. Ward, and Darrell Morris. 1963. Multipurpose Modification of Playa Sinks, "Section on Biology," Project Number 29, Division of Water Supply and Pollution Control, U.S.P.H.S., Second Annual Report. 1-68.

11. Huddleston, E. W., Donald Ashdown, Charles E. Forehand, Charles R. Ward, and Darrell Morris. 1964. Multipurpose Modification of Playa Sinks, "Section on Biology," Project Number 29, Division of Water Supply and Pollution Control. U.S.P.H.S., Third Annual Report. 1-114.

12. Huddleston, E. W., and Donald Ashdown. 1965. Controlling Insects in the Southwest, Lawns, Trees, and Shrubs. Department of Park Administration, Horticulture and Entomology. Tech Press. 1-31.

Dr. Donald Ashdown (Continued)

13. Huddleston, E. W., and Donald Ashdown. A Laboratory Manual for Introductory Entomology (Mimeo. Series) in Use at Texas Technological College.

14. Huddleston, E. W., Donald Ashdown, Charles E. Forehand, Randolph Schaefer, and Don Herzog. 1965. Effects of the 1964 High Plains Boll Weevil Control Program on Population Trends of Non-Target Insects. Effects on the Environment of the 1964 Boll Weevil Diapause Control Program in the Texas High Plains, Plant Pest Control Division, U.S.D.A. 1-43.

Dr. Ellis W. Huddleston, Associate Professor of Entomology

1. Huddleston, E. W. and G. G. Gyrisco. 1960. Residues of Sevin and 1-Naphthel on Forage from Aerial Application of Sevin in Oil. Journal of Economic Entomology. 53:484.

2. Huddleston, E. W., G. G. Gyrisco, and D. S. Lisk. 1960. DDT Residues on New York Dairy Farms Following the Gypsy Moth Eradication Program. Journal of Economic Entomology. 53:1019-1021.

3. Huddleston, E. W., K. H. Thompson, . G. Gyrisco, and D. J. Lisk. 1960. Sampling Experimental Plots of Alfalfa for Insecticide Residues. Journal of Economic Entomology. 53:1078-1080.

4. Huddleston, E. W., 1960. Sampling Alfalfa for Determination of Insecticides. Doctoral Thesis. Cornell University, Ithaca, New York. 82 pp.

5. Bache, C. A., D. J. Lisk, S. N. Fertig, E. W. Huddleston, F. H. Fox, G. W. Trimberger, and R. F. Holland, 1960. Effects of Feeding Low Levels of Heptachlor Epoxide to Dairy Cows on the Residues and Off Flavors of Milk. Journal of Agricultural and Food Chemistry. 8:408-409.

6. Gyrisco, G. G., D. J. Lisk, S. N. Fertig, E. W. Huddleston, F. H. Fox, R. F. Holland, and G. W. Trimberger. 1960. The Effects of Feeding High Levels of Sevin on Residues, Flavor and Odor of the Milk of Dairy Cattle. Journal of Agricultural and Food Chemistry. 8:409-410.

7. Ashdown, D. A., and Ellis W. Huddleston. 1961. "Greenbug Control in West Texas." Reports on Agricultural Industry. Texas Technological College. 2:5.

8. Box, T. A., Ellis W. Huddleston, Donald Ashdown, and Tom Copeland. 1962. "Biological Die-Off of Perennial Broomweed." Reports on Agricultural Industry. Texas Technological College. 3:1-2.

9. Huddleston, E. W., Donald Ashdown, Charles R. Ward, and Darrell Morris. 1962. Multipurpose Modification of Playa Sinks. "Section on Biology." Project Number 29. Division of Water Supply and Pollution Control, U.S.P.H.S., First Annual Report. 1-123.

10. Hardee, D. D., E. W. Huddleston, and G. G. Gyrisco. 1963. Initial Deposits and Disappearance Rates of Various Insecticides as Affected by Forage Crop Species. Journal of Economic Entomology. 56:98-101.

11. Huddleston, E. W., Donald Ashdown, and Bruce Maunder. 1963. "Control of the Sorghum Midge, Preliminary Studies." Reports on Agricultural Industry. Texas Technological College. 4:1-2.

12. Huddleston, E. W., Donald Ashdown, Charles R. Ward, and Darrell Morris. 1963. Multipurpose Modification of Playa Sinks, "Section on Biology". Project Number 29, Division of Water Shpply and Pollution Control. U.S.P.H.S., Second Annual Report. 1-68.

Dr. E. W. Huddleston (Continued)

13. Huddleston, E. W., Donald Ashdown, Charles E. Forehand, Charles R. Ward, and Darrell Morris. 1964. Multipurpose Modification of Playa Sinks. "Section on Biology" Project Number 29, Division of Water Supply and Pollution Control, U.S.P.H.S., Third Annual Report. 1-114.

14. Huddleston, E. W., and G. G. Gyrisco. 1968. Residues from Several Organophesphorus Insecticides on Alfalfa. (in press).

15. Huddleston, E. W., and Donald Ashdown. 1965. Controlling Insects in the Southwest, Lawns, Trees, and Shrubs. Department of Park Administration, Horticulture and Entomology. Tech Press. 1-31.

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17. Huddleston, E. W., and Virginia Riggs. 1965. Public Health Aspects of West Texas Water, Texas Water Development Board. Report 10: 9-16.

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19. Huddleston, E. W., and Sam F. Fluker. 1968. Studies on the Ants of Hawaii. (Accepted for publication in the Proceedings of the Hawaiian Entomological Society.)

20. Fluker, S. F., Ellis W. Huddleston, and J. W. Beardsley. 1968. Effect of the Ant, Pheidole megacephala, on Populations of the Pink Sugarcane Mealybug. Journal of Economic Entomology. 61: 474-477.

Dr. Charles R. Ward, Assistant Professor of Entomology

1. Forehand, Charles E., Charles R. Ward, Ellis W. Huddleston, Darrell W. Morris, and Donald Ashdown. 1964. "Biology Sections" IN Multipurpose Modification of Playa Sinks, Project Number 29, Division of Water Supply and Pollution Control, U.S.P.H.S., Third Annual Progress Report, Lubbock, Texas. pp. 1-114.

2. Huddleston, E. W., Charles R. Ward, Donald Ashdown, Darrell W. Morris, and David B. Francy. 1962. Biology and Ecology of Playa Lakes IN Multipurpose Modification of Playa Sinks, Project Number 29, Division of Water Supply and Pollution Control, U.S.P.H.S., First Annual Progress Report, Lubbock, Texas. pp. 1-123.

3. Huddleston, E. W., Charles R. Ward, Donald Ashdown, and Darrell W. Morris. 1963. Biology and Ecology of Playa Lakes IN Multipurpose Modification of Playa Sinks, Project Number 29. Division of Water Supply and Pollution Control, U.S.P.H.S., Second Annual Progress Report, Lubbock, Texas. pp. 1-68.

4. Huddleston, Ellis W., Ricardo Parodi, and Charles R. Ward, Astylus Atromaculatus, A Pest of Grain Sorghum in Argentina. 1968.

5. Huddleston, Ellis W., Donald Ashdown, Charles R. Ward, Ricardo Parodi, and Bruce Maunder. Chemical Control of the Sorghum Midge in Texas and Argentina. 1968.

6. Huddleston, Ellis W., and Charles R. Ward, 1967. Entomology Progress Report. 67-1, Texas Technological College, Lubbock, Texas.

7. Huddleston, Ellis W., Charles R. Ward, Charles E. Forehand, Darrell W. Morris, and Donald Ashdown. Multipurpose Modification of Playa Sinks--A Final Report. Project Number 29, Division of Water Supply and Pollution Control, U.S.P.H.S., Lubbock, Texas. (For release in 1968).

8. Huddleston, Ellis W., Charles R. Ward, and Thomas M. Hills. Control of Mites Affecting Grain Sorghum. (To be released in 1969 in the Journal of Economic Entomology).

9. Ward, Charles R. 1964. Ecological Changes in Modified Playa Lakes with Special Emphasis on Mosquito Production. M. S. Thesis, Texas Technological College, Lubbock, Texas.

10. Ward, Charles R. 1968. Mosquito Production in Natural and Modified Playa Lakes. Ph.D. Dissertation. Cornell University, Ithaca, New York.

E. Undergraduate and Graduate Enrollment

1956-1967
UNDERGRADUATE ENROLLMENT - FALL SEMESTERS

Year	Horticulture & Park Management	Entomology
1956	58	0
1957	66	0
1958	67	13
1959	64	14
1960	72	16
1961	65	16
1962	67	14
1963	107	21

	Park Administration	Horticulture	
1964	103	31	28
1965	105	31	29
1966	92	39	40
1967	90	31	36

GRADUATE ENROLLMENT

Year	Park Administration	Horticulture	Entomology
1965	5	2	2
1966	5	2	2
1967	10	3	6

F. Departmental Summary Budgets, 1961-1968

SCHOOL OF AGRICULTURE

HORTICULTURE AND PARK MANAGEMENT (12 Months)	1961-62	1962-63
Professor		
Elo Joe Urbanovsky, Head	$ 9,500.00(a)rt	$ 10,400.00(a)rt
Donald Ashdown	10,062.00(b)rt	10,802.00(b)rt
George O. Elle	(c) t	(c) t
Warren Watson Yocum (9 Months)	8,900.00rt	9,600.00rt
Associate Professor		
Edward William Zukauckas, Jr.	6,300.00(d)rt	7,000.00(d)rt
Assistant Professor		
Robert Rentoul Reed	-0-	5,562.00(e)rt
William Marcus Gosdin	1,300.00(f)rt	1,600.00(f)rt
Ellis Wright Huddleston	5,250.00(g)rn	5,535.00(g)rn
Instructor		
Robert Rentoul Reed	4,912.00(e)rn	-0-

(a) Plus $4,600.00 from the budget for Care and Maintenance of Grounds. Sixty-five per cent of time devoted to teaching duties. Total salary for 12 months, $14,100.00 (1961-62) and $15,000.00 (1962-63).

(b) Teaching full-time for 10½ months, $10,062.00 (1961-62) and $10,802.00 (1962-63); full-time on Research for 1½ months, $1,438.00; total salary for 12 months, $11,500.00 (1961-62) and $12,240.00 (1962-63).

(c) On the budget for the Office of the Dean of Agriculture.

(d) Full-time teaching for 9 months. Full-time on budget for the Greenhouse for 3 months.

(e) Teaching full-time for 9 months, $4,912.00 (1961-62) and $5,562.00 (1962-63) and full-time Research for 3 months. Total salary for 12 months, $6,550.00 (1961-62) and $7,200.00 (1962-63).

(f) Also on the budget for Care and Maintenance of Grounds and the Texas State Parks Board Project.

(g) Three-fourths time for 9 months; also one-fourth time in the Department of Biology. Total salary for 9 months, $7,000.00 (1961-62) and $7,380.00 (1962-63).

SCHOOL OF AGRICULTURE

HORTICULTURE AND PARK MANAGEMENT (12 Months)	1961-62	1962-63
Instructor		
Donnie Joe Johnson	$ 5,250.00(a)rn	$ 5,833.00(a)rn
Elner Howard Thompson	1,000.00(b)rn	1,000.00(b)rn
Secretary II (116)		
Mrs. Dorothy Ann Bell	2,385.00(c)d	2,385.00(c)d
Labor (Greenhouse)	2,200.00d	2,200.00d
Miscellaneous Labor (Vegetable Garden)	1,100.00d	1,100.00d
Student Assistants (12 Months)	1,850.00d	2,400.00d
Maintenance, Equipment and Travel	11,815.00d	3,650.00d
Total	$ 71,824.00	$ 69,067.00

(a) Total salary for 12 months, $6,000.00 (1961-62) and $6,683,00 (1962-63). Teaching full-time for 10½ months and on Greenhouse Budget for 1½ months.
(b) Teaching part-time for 9 months. Also on budget for the Texas State Parks Board Project. Total salary for 12 months, $5,000.00.
(c) Also Part-time Secretary, Care and Maintenance of Grounds, at a salary of $785.00 for 12 months. Total salary, $3,180.00.

Horticulture and Park Management	First Term	Second Term	1962 Total
Professor			
Elo Joe Urbanovsky, Head	Annual Salary(a)	Annual Salary(a)	Annual Salary(a)
Donald Ashdown	(b)	(c)	-0-
Assistant Professor			
Ellis Wright Huddleston	$ 1,166.00	$ (d)	$ 1,166.00
Instructor			
Donnie Joe Johnson	Annual Salary(e)	(f)	Annual Salary
Robert Rentoul Reed	(g)	(g)	(g)
Total ----------	$ 1,166.00	$ -0-	$ 1,166.00

(a) Teaching sixty-five per cent of the time; also on the Budget for Care and Maintenance of Grounds.

(b) Teaching full-time in the Summer Institute for Summer School Teachers of Biology, at a salary of $1,437.00. This salary is to be paid from Grant Funds, Account No. 3034C.

(c) On Organized Research Project, Account No. 1602E, at a salary of $1,438.00 for the period, July 16, 1962 through August 31, 1962.

(d) On Organized Research Project, Account No. 1616, at a salary of $1,167.00 for the period, July 16, 1962 through August 31, 1962.

(e) Teaching full-time, First Term only.

(f) Full-time on the Budget for Care and Maintenance of Grounds.

(g) Full-time on Organized Research Project, Account No. 1611, at a salary of $1,638.00 for the period, June 1, 1962 through August 31, 1962.

HORTICULTURE AND PARK MANAGEMENT
(Greenhouse--Account No. 1302)
(12 Months)

	1961-62	1962-63
Greenhouse Manager		
Edward W. Zukauckas, Jr.	$ 2,100.00(a)	$ 2,100.00(a)
Part-time Horticulturist		
Donnie Joe Johnson	750.00(b)	750.00(b)
Farm Worker I (588)		
_____	-0-	1,200.00(c)
Miscellaneous Labor	4,100.00	4,100.00
Maintenance, Equipment and Travel	1,600.00	1,600.00
Total	$ 8,550.00	$ 9,750.00

(a) Plus $6,300.00 (1961-62) and (1962-63) from the budget for Horticulture and Park Management. Teaching full-time for 9 months. Contract from this budget dated June 1 through August 31.
(b) Also Instructor in Horticulture and Park Management at a salary of $5,250.00 for 10½ months (1961-62) and $5,833.00 for 10½ months (1962-63).
(c) One-half time.

SCHOOL OF AGRICULTURE

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY (12 Months)	1962-63	1963-64
Professor		
Elo Joe Urbanovsky, Head	$ 10,400.00(a)rt	$ 11,400.00(a)rt
Donald Ashdown	10,802.00(b)rt	11,375.00(b)rt
George O. Elle	(c) t	10,300.00rt
Warren Watson Yocum (9 Months)	9,600.00rt	-0-
Associate Professor		
Edward William Zukauckas, Jr.	7,000.00(d)rt	10,000.00rt
Assistant Professor		
Robert Rentoul Reed	5,562.00(e)rt	6,000.00(e)rt
William Marcus Gosdin	2,767.00(f)rt	4,500.00(g)rt
Ellis Wright Huddleston	5,535.00(h)rn	5,925.00(h)rn

(a) Plus $4,600.00 from the budget for Care and Maintenance of Grounds. Sixty-five per cent of time devoted to teaching duties. Total salary for 12 months, $15,000.00 (1962-63) and $16,000.00 (1963-64).
(b) Teaching full-time for 10½ months, $10,802.00 (1962-63) and $11,375.00 (1963-64); full-time on Research for 1½ months; total salary for 12 months, $12,240.00 (1962-63) and $13,000.00 (1963-64).
(c) On the budget for the Office of the Dean of Agriculture.
(d) Full-time teaching for 9 months. Full-time on budget for the Greenhouse for 3 months.
(e) Teaching full-time for 9 months; full-time Research for 3 months. Total salary for 12 months, $7,200.00 (1962-63) and $8,000.00 (1963-64).
(f) Also on the budget for Care and Maintenance of Grounds and the Texas State Parks Board Project.
(g) Also on the budget for Care and Maintenance of Grounds.
(h) Three-fourths time for 9 months; also one-fourth time in the Department of Biology. Total salary for 9 months, $7,380.00 (1962-63) and $7,900.00 (1963-64).

SCHOOL OF AGRICULTURE

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY (12 Months)	1962-63	1963-64
Instructor		
Donnie Joe Johnson	$ 5,833.00(a)rn	$ 6,300.00(a)rn
Elner Howard Thompson	1,000.00(b)rn	-0-
Secretary II (116)		
Mrs. Mary Kate Hunt	2,385.00(c)d	3,180.00d
Labor (Greenhouse)	2,200.00d	2,700.00d
Miscellaneous Labor (Vegetable Garden)	1,100.00d	1,300.00d
Student Assistants and/or Part-time Help	2,400.00d	2,600.00d
Maintenance, Equipment and Travel	3,650.00d	4,150.00(d)d
Total ----------	$ 70,234.00	$ 79,730.00

(a) Total salary for 12 months, $6,583.00 (1962-63) and $7,200.00 (1963-64). Teaching full-time for 10½ months and on Greenhouse Budget for 1½ months.
(b) Teaching part-time for 9 months. Also on budget for the Texas State Parks Board Project. Total salary for 12 months, $5,000.00.
(c) Also Part-time Secretary, Care and Maintenance of Grounds, at a salary of $795.00 for 12 months. Total salary, $3,180.00.
(d) Allocation for travel--$1,600.00.

Park Administration, Horticulture and Entomology	First Term	Second Term	1964 Total
Professor			
Elo Joe Urbanovsky, Head	Annual Salary(a)	Annual Salary(a)	Annual Salary(a)
Donald Ashdown	Annual Salary(b)	Annual Salary(c)	Annual Salary
George O. Elle	Annual Salary	Annual Salary	Annual Salary
Associate Professor			
Edward William Zukauckas, Jr.	Annual Salary	Annual Salary	Annual Salary
Assistant Professor			
Ellis Wright Huddleston	(d)	$ 1,316.00	$ 1,316.00
Robert Rentoul Reed	(e)	(e)	(e)
Instructor			
Donnie Joe Johnson	Annual Salary(f)	Annual Salary(f)	Annual Salary(f)
Total ----------	Annual Salary	$ 1,316.00	$ 1,316.00

(a) Teaching sixty-five percent of the time; also on the budget for Care and Maintenance of Grounds.

(b) Teaching full-time the first term.

(c) On Organized Research Project Account No. 191-4113 at a salary of $1,625.00 for the period July 16, 1964, through August 31, 1964.

(d) On Organized Research Project Account No. 191-4114 at a salary of $1,317.00 for the period June 2, 1964, through July 15, 1964.

(e) On Organized Research Project Account No. 191-4115 at a salary of $2,000.00 for the period June 1, 1964, through August 31, 1964.

(f) Teaching full-time the first term. On the Greenhouse budget for the second term.

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY
(Greenhouse--Account No. 1302)
(12 Months)

	1962-63	1963-64
Greenhouse Manager		
Edward W. Zukauckas, Jr.	$ 2,100.00(a)	$ -0-
Part-time Horticulturist		
Donnie Joe Johnson	750.00(b)	900.00(b)
Farm Worker I (588)		
_____	1,200.00(c)	1,200.00(c)
Miscellaneous Labor	4,100.00	4,000.00
Maintenance, Equipment and Travel	1,600.00	1,600.00
Total ----------	$ 9,750.00	$ 7,700.00

(a) Also Associate Professor in the Department of Park Administration, Horticulture and Entomology.
(b) Also Instructor in the Department of Park Administration, Horticulture and Entomology. Contract dated July 16 through August 31.
(c) One-half time.

SCHOOL OF AGRICULTURE

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY (12 Months)	Item No.	1963-64	1964-65
Professor			
Elo Joe Urbanovsky, Head	1	$ 11,400.00(a)rt	$ 12,400.00(a)rt
Donald Ashdown	2	11,375.00(b)rt	11,925.00(b)rt
Charles E. Doell	-0-	2,800.00(c)rn	-0-
George O. Elle (9 Months)	3	7,076.34(d)rt	11,100.00rt
Associate Professor			
Edward William Zukauckas, Jr.	4	10,000.00rt	10,875.00rt
Assistant Professor			
William Marcus Gosdin	-0-	2,625.00(e)rt	-0-
Ellis Wright Huddleston	5	5,925.00(f)rn	6,525.00(f)rt
_____	6	-0-	8,800.00rn
James William Kitchen	7	1,875.00(g)rn	4,500.00(g)rn

(a) Plus $4,600.00 from the budget for Care and Maintenance of Grounds. Sixty-five per cent of time devoted to teaching duties. Total salary for 12 months, $16,000.00 (1963-64) and $17,000.00 (1964-65).

(b) Teaching full-time for 10½ months; full-time on Research for 1½ months; total salary for 12 months, $13,000.00 (1963-64) and $13,550.00 (1964-65).

(c) Appointment February 15, 1964 through April 30, 1964.

(d) Teaching full-time 1963 fall semester; teaching part-time from February 9, 1964 through August 31, 1964; also Assistant Dean from February 9, 1964 through August 31, 1964.

(e) Also on the budget for Care and Maintenance of Grounds. Resigned March 31, 1964.

(f) Three-fourths time for 9 months; also one-fourth time in the Department of Biology. Total salary for 9 months, $7,900.00 (1963-64) and $8,700.00 (1964-65).

(g) Appointed April 1, 1964; also on the budget for Care and Maintenance of Grounds. Teaching one-half time for 9 months; total salary for 12 months, $11,200.00.

SCHOOL OF AGRICULTURE

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY (12 Months)	Item No.	1963-64	1964-65
Assistant Professor			
Robert Rentoul Reed	8	$ 6,000.00(a)rt	$ 6,600.00(a)rt
Instructor			
Donnie Joe Johnson	-0-	6,300.00(b)rn	(c) rn
Secretary II (116)			
Mrs. Mary Kate Hunt	9	3,360.00d	3,360.00d
Labor (Greenhouse)	10	2,700.00d	2,700.00d
Miscellaneous Labor (Vegetable Garden)	11	1,300.00d	1,300.00d
Student Assistants and/or Part-time Help	12	2,600.00d	2,600.00d
Maintenance, Equipment and Travel	13	4,150.00d	4,300.00(d)d
Total ----------		$ 79,486.34	$ 86,985.00

(a) Teaching full-time for 9 months; full-time Research for 3 months. Total salary for 12 months, $8,000.00 (1963-64) and $8,600.00 (1964-65).
(b) Total salary for 12 months, $7,200.00 (1963-64); teaching full-time for 10½ months and on Greenhouse Budget for 1½ months.
(c) On academic leave.
(d) Allocation for travel--$1,600.00.

Park Administration, Horticulture and Entomology	Item	First Term	Second Term	1965 Total
Professor				
Elo Joe Urbanovsky, Head	1	Annual Salary(a)	Annual Salary(a)	Annual Salary
Donald Ashdown	2	Annual Salary(b)	Annual Salary(c)	Annual Salary
Associate Professor				
Edward William Zukauckas, Jr.	3	Annual Salary(d)	Annual Salary(d)	Annual
Assistant Professor				
Ellis Wright Huddleston	4	(e)	$ 1,450.00	$ 1,450.00
James William Kitchen	5	Annual Salary(f)	Annual Salary(f)	Annual Salary
Robert Rentoul Reed	6	(g)	(g)	(g)
Instructor				
Bill Aubrey Chevalier	7	$ 1,000.00	-0-	1,000.00
Total ----------		$ 1,000.00	$ 1,450.00	$ 2,450.00

(a) Teaching sixty-five per cent of the time; also on the budget for Care and Maintenance of Grounds.

(b) Teaching full-time the first term.

(c) On Organized Research Project Account No. 191-4121 at a salary of $1,625.00 for the period July 16, 1965, through August 31, 1965.

(d) Also Greenhouse Manager.

(e) On Organized Research Project Account No. 191-4114 at a salary of $1,317.00 for the period June 1, 1965, through July 15, 1965.

(f) Also Superintendent, Care and Maintenance of Grounds (full-time on the campus budget for the summer of 1965).

(g) On Organized Research Project Account No. 191-4115 at a salary of $2,000.00 for the period June 1, 1965, through August 31, 1965.

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY
(12 Months)

	Item No.	1963-64	1964-65
Greenhouse Manager			
Edward W. Zukauckas, Jr.	1	$ -0- (a)	$ -0- (a)
Part-time Horticulturist			
Donnie Joe Johnson	2	900.00(b)	-0- (b)
Farm Worker I (588)			
_____	3	1,200.00(c)	1,200.00(c)
Miscellaneous Labor	4	4,400.00	4,000.00
Maintenance, Equipment and Travel	5	1,600.00	1,600.00
Total		$ 8,100.00	$ 6,800.00

(a) Also Associate Professor in the Department of Park Administration Horticulture and Entomology.
(b) Also Instructor in the Department of Park Administration, Horticulture and Entomology; contract dated July 16 through August 31; on academic leave in 1964-65.
(c) One-half time.

SCHOOL OF AGRICULTURE

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY (12 Months)	Item	1964-65	1965-66
Professor			
Elo Joe Urbanovsky, Head	1	$ 12,400.00(a)rt	$ 13,900.00(a)rt
Donald Ashdown (9 Months)	2	11,925.00(b)rt	11,445.00rt
Charles E. Doell (4 Months)	3	3,000.00(c)rn	5,100.00(c)rn
George O. Elle (9 Months)	4	11,100.00rt	12,600.00rt
Associate Professor			
Ellis Wright Huddleston (9 Months)	5	-0-	9,975.00rt
Edward William Zukauckas, Jr.	6	10,875.00rt	12,000.00rt
Assistant Professor			
Ellis Wright Huddleston	7	6,525.00(d)rt	-0-
James William Kitchen	8	4,500.00(e)rn	5,355.00(e)rn
Assistant Professor			
Robert Rentoul Reed (9 Months)	9	6,600.00(f)rt	7,980.00rt

(a) Also on the budget for Care and Maintenance of Grounds; total salary for 12 months, $17,000.00 (1964-65) and $19,000.00 (1965-66).
(b) Teaching full time for 10½ months; full time on Research for 1½ months.
(c) Spring Semester.
(d) Three-fourths' time for 9 months; also one-fourth time in the Department of Biology.
(e) Also on the budget for Care and Maintenance of Grounds. Teaching one-half time for 9 months.
(f) Teaching full time for 9 months; full time Research for 3 months.

SCHOOL OF AGRICULTURE

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY (12 Months)	Item	1964-65	1965-66
Instructor			
Bill Aubrey Chevalier (9 Months)	10	$ 6,000.00rn	$ 7,245.00rn
Part-time Instructor			
Arvil Curtis Hamilton	11	600.00(a)rn	650.00(a)rn
Secretary II (116)			
Mrs. Mary Kate Hunt	12	3,540.00d	3,720.00d
Labor (Greenhouse)	13	2,700.00d	2,700.00d
Miscellaneous Labor (Vegetable Garden)	14	1,300.00d	1,300.00d
Student Assistants and/or Part-time Help	15	2,600.00d	2,600.00d
Maintenance, Equipment and Travel	16	4,300.00d	6,300.00(b)d
Total ----------	17	$ 87,965.00	$102,870.00

(a) Spring Semester.
(b) Allocation for travel--$1,600.00.

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY
(12 Months)

	Item	1964-65	1965-66
Greenhouse Manager			
Edward W. Zukauckas, Jr.	1	$ -0- (a)	$ -0- (a)
Miscellaneous Labor	2	5,200.00	5,200.00
Maintenance, Equipment and Travel	3	1,600.00	3,200.00
Total ----------		$ 6,800.00	$ 8,400.00

(a) Also Associate Professor in the Department of Park Administration, Horticulture and Entomology.

SCHOOL OF AGRICULTURE

PARK ADMINISTRATION, HORTICULTURE, AND ENTOMOLOGY	Item	1965-66	1966-67
Professor			
Elo Joe Urbanovsky, Head (12 Months)	1	$ 13,900.00(a)rt	$ 14,900.00(a)rt
Donald Ashdown	2	11,445.00rt	11,445.00rt
Charles E. Doell (3 Months)	3	2,569.00(b)rn	-0-
_____	4	-0-	4,100.00(c)rn
George O. Elle	5	12,600.00rt	13,200.00rt
Associate Professor			
Ellis Wright Huddleston	6	9,975.00rt	(d) t
Edward William Zukauckas, Jr. (12 Months)	7	12,000.00rt	12,600.00rt
Assistant Professor			
James William Kitchen	8	5,355.00(e)rn	6,255.00(e)rn
Robert Rentoul Reed	9	7,980.00rt	7,980.00rt
_____	10	-0-	5,200.00(f)rn
Instructor			
Bill Aubrey Chevalier	11	7,245.00rn	7,245.00rn
Thomas Alec Musiak	12	6,900.00rn	7,300.00rn
Mrs. Virginia Casterton Riggs	13	-0-	3,400.00(g)rn

(a) Also on the budget for Care and Maintenance of Grounds; total salary for 12 months, $19,000.00 (1965-66) and $20,000.00 (1966-67).
(b) Approximately one-half time for three and one-half months.
(c) Approximately two-fifths time.
(d) On academic leave, 1966-67.
(e) Also on the budget for Care and Maintenance of Grounds. Teaching one-half time for 9 months. Total salary for 12 months, $12,855.00 (1965-66) and $13,555.00 (1966-67).
(f) For the 1967 spring semester (salary rate, $10,400.00 for 9 months).
(g) Visiting Instructor for the 1966 fall semester. This is a non-tenure appointment.

SCHOOL OF AGRICULTURE

PARK ADMINISTRATION, HORTICULTURE, AND ENTOMOLOGY (Continued)	Item	1965-66	1966-67
Instructor (Part-time)			
Arvil Curtis Hamilton	14	$ 650.00(a)rn	$ 650.00(a)rn
Secretary II (12 Months, 116)			
Mrs. Mary Kate Hunt	15	3,720.00d	3,720.00d
Labor (Greenhouse)	16	2,700.00d	2,700.00d
Miscellaneous Labor (Vegetable Garden)	17	1,300.00d	1,300.00d
Student Assistants and/or Part-time Help	18	2,600.00d	2,600.00d
Maintenance, Equipment and Travel	19	6,300.00(b)d	6,300.00(b)d
Total ----------	20	$107,239.00	$110,895.00

(a) Spring semester.
(b) Allocation for travel--$1,600.00.

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY	Item	First Term	Second Term	1967 Total
Professor				
Elo Joe Urbanovsky, Head	1	$ (a)	$ (a)	$ (a)
Donald Ashdown	2	1,431.00	-0-	1,431.00
Associate Professor				
Ellis Wright Huddleston	3	(b)	(b)	(b)
Edward William Zukauckas, Jr.	4	(c)	(c)	(c)
Assistant Professor				
James William Kitchen	5	(d)	(d)	(d)
Robert Rentoul Reed	6	(e)	(e)	(e)
Charles Richard Ward	7	-0-	1,250.00	1,250.00
Instructor				
Bill Aubrey Chevalier	8	906.00	-0-	906.00
Thomas Alec Musiak	9	(f)	(f)	(f)
Total ----------	10	$ 2,337.00	$ 1,250.00	$ 3,587.00

(a) Annual salary. Teaching three-fourths' time for 12 months, Physical Plant one-fourth time. Teaching salary $3,725.00 for the 1967 Summer School.

(b) Full time on Organized Research Account No. 191-4114 for the period August 1, 1967, through August 31, 1967, at a salary of $971.00. Part-time on Account No. 391-1056 for the period June 1, 1967, through July 31, 1967, at a salary of $174.18.

(c) Annual salary. Teaching full time for the 1967 Summer Session at a teaching salary of $3,150.00.

(d) Annual salary. Full time on Physical Plant for 3 months.

(e) Full time on Organized Research Account No. 191-4115 at a salary of $1,995.00 for 3 months.

(f) Full time on State Park Research, Account No. 191-8120 for 3 months at a salary of $1,869.00.

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY	Item	First Term	Second Term	1967 Total
Professor				
Elo Joe Urbanovsky, Head	1	$ (a)	$ (a)	$ (a)
Donald Ashdown	2	1,431.00	-0-	1,431.00
Associate Professor				
Ellis Wright Huddleston	3	(b)	(b)	(b)
Edward William Zukauckas, Jr.	4	(c)	(c)	(c)
Assistant Professor				
James William Kitchen	5	(d)	(d)	(d)
Robert Rentoul Reed	6	(e)	(e)	(e)
Charles Richard Ward	7	-0-	1,250.00	1,250.00
Instructor				
Bill Aubrey Chevalier	8	906.00	-0-	906.00
Thomas Alec Musiak	9	(f)	(f)	(f)
Total ----------	10	$ 2,337.00	$ 1,250.00	$ 3,587.00

(a) Annual salary. Teaching three-fourths' time for 12 months, Physical Plant one-fourth time. Teaching salary $3,725.00 for the 1967 Summer School.

(b) Full time on Organized Research Account No. 191-4114 for the period August 1, 1967, through August 31, 1967, at a salary of $971.00. Part-time on Account No. 391-1056 for the period June 1, 1967, through July 31, 1967, at a salary of $174.18.

(c) Annual salary. Teaching full time for the 1967 Summer Session at a teaching salary of $3,150.00.

(d) Annual salary. Full time on Physical Plant for 3 months.

(e) Full time on Organized Research Account No. 191-4115 at a salary of $1,995.00 for 3 months.

(f) Full time on State Park Research, Account No. 191-8120 for 3 months at a salary of $1,869.00.

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY
(12 Months)

	Item	1965-66	1966-67
Greenhouse Manager			
Edward W. Zukauckas, Jr.	1	$ -0- (a)	$ -0- (a)
Miscellaneous Labor	2	5,200.00	5,200.00
Maintenance, Equipment and Travel	3	3,200.00	3,200.00
Total ----------	4	$ 8,400.00	$ 8,400.00

(a) Also Associate Professor in the Department of Park Administration, Horticulture and Entomology.

SCHOOL OF AGRICULTURE

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY	Item	1966-1967	1967-1968
Professor			
Elo Joe Urbanovsky, Chairman (12 Months)	1	$ 14,900.00(a)	$ 18,400.00(a)
Donald Ashdown	2	11,445.00	(b)
C. E. Doell	3	-0-	4,100.00(c)
George O. Elle	4	3,548.38(d)	13,222.00(e)
Associate Professor			
Ellis Wright Huddleston	5	(b)	12,000.00
James William Kitchen	6	-0-	12,000.00(f)
Edward William Zukauckas, Jr. (12 Months)	7	12,600.00	14,400.00
Assistant Professor			
James William Kitchen	8	6,255.00(g)	-0-
Robert Rentoul Reed	9	7,980.00	8,400.00
Glen Myrlin Rydl	10	9,637.06(h)	11,000.00
Charles Richard Ward	11	5,000.00(i)	10,700.00
_____	12	-0-	12,000.00

(a) Approximately three-fourths time. Also on the budget for Care and Maintenance of Grounds. Total salary for 12 months, $20,000.00 (1966-1967) and $23,000.00 (1967-1968).
(b) On leave.
(c) One-half time for the spring semester.
(d) One-fourth time. Also Director of the Peace Corps Training Program.
(e) Contract from September 16 through May 31 at a salary of $14,000.00 for 9 months.
(f) Also on budget for Care and Maintenance of Grounds. Total salary, $16,000.00 for 12 months.
(g) Also on the budget for Care and Maintenance of Grounds. Teaching one-half time for 9 months. Total salary for 12 months, $13,555.00.
(h) Base salary $10,400.00 for 9 months, effective May 5, 1967.
(i) Spring semester.

SCHOOL OF AGRICULTURE

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY (Continued)	Item	1966-1967	1967-1968
Instructor			
Bill Aubrey Chevalier	13	$ 7,245.00	$ 7,500.00
Thomas Alec Musiak	14	7,300.00	7,600.00
Mrs. Virginia Casterton Riggs	15	5,100.00(a)	-0-
Arvil Curtis Hamilton, Sr.	16	650.00(b)	700.00(c)
Secretary II (116, 12 Months)			
Mrs. Mary Kate Hunt	17	3,900.00	4,260.00
Labor (Greenhouse)	18	2,700.00	3,300.00
Miscellaneous Labor (Vegetable Garden)	19	1,300.00	1,400.00
Student Assistants and/or Part-time Help	20	6,600.00	2,300.00
Laboratory Assistants	21	2,805.00	-0-
Maintenance, Equipment and Travel	22	6,300.00(d)	8,200.00(d)
Total ----------	23	$115,265.44	$151,482.00

(a) Visiting Instructor. Approximately three-fourths time.
(b) One-fifth time for the spring semester.
(c) Approximately one-fourth time for the spring semester.
(d) Allocation for travel--$1,600.00.

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY	Item	First Term	Second Term	1968 Total
Professor				
Elo Joe Urbanovsky, Chairman	1	$ (a)	$ (a)	$ (a)
Donald Ashdown	2	(b)	(b)	(b)
Associate Professor				
Ellis Wright Huddleston	3	2,000.00	(c)	2,000.00
James William Kitchen	4	(d)	(d)	(d)
Emmanuel Theodorus Gregorius Maria Van Nierop	5	2,083.00	-0-	2,083.00
Edward William Zukauckas, Jr.	6	(e)	(e)	(e)
Assistant Professor				
Robert Rentoul Reed	7	(f)	(g)	-0-
Charles Richard Ward	8	(h)	1,783.00	1,783.00
Instructor				
Bill Aubrey Chevalier	9	1,250.00	-0-	1,250.00
Total ----------	10	$ 5,333.00	$ 1,783.00	$ 7,116.00

(a) Annual contract. Teaching three-fourths' time for 12 months.

(b) On leave. Part-time on Organized Research Account No. 391-1056.

(c) Full time on Organized Research Account No. 191-4114 at a salary of $2,000.00 (July 15, 1968 through August 24, 1968).

(d) Full time with Physical Plant for the 1968 Summer Session (p. 245).

(e) Annual contract.

(f) Full time on Organized Research Account No. 191-4115 at a salary of $1,400.00 for the first term.

(g) Full time on Organized Research Account No. 191-8217 at a salary of $1,400.00 for the second term.

(h) Full time on Organized Research Account No. 191-4121 at a salary of $1,783.00 for the first term.

PARK ADMINISTRATION, HORTICULTURE AND ENTOMOLOGY GREENHOUSE
(12 Months)

Item		1966-67	1967-68
Greenhouse Manager			
Edward W. Zukauckas, Jr.	1	$ (a)	$ (a)
Greenhouse Foreman (590)			
Fernando G. Romo	2	-0-	4,260.00
Laborer I (108, Part-time)			
Eutemio Esqueda	3	-0-	1,320.00
Miscellaneous Labor	4	6,200.00	-0-
Maintenance, Equipment and Travel	5	3,200.00	3,200.00
Total ----------	6	$ 9,400.00	$ 8,780.00

(a) Also Associate Professor in the Department of Park Administration, Horticulture and Entomology.

II. CURRENT STATUS

A. Enrollment for the Fall Semester, 1967

	Park Administration	Horticulture	Entomology
Undergraduate	90	31	36
Graduate	7	2	9
Anticipated Enrollment, 1968:			
Undergraduate	120	35	50
Graduate	15	3	8

B. Space Available

According to the Office of Institutional Studies and Space Utilization, total space available to the Department of Park Administration, Horticulture, and Entomology is 3,520 square feet for classroom and laboratories and 1,483 square feet for offices. This total of 5,003 square feet includes space in Agricultural Plant Sciences, X-74,Agriculture Building, and Agricultural Engineering Building.

An additional 1,800 square foot structure is located on the Horticulture farm on the west side of the campus. This structure is used jointly by the Horticulture and Entomology sections as a storage area and as headquarters for field research in both subject areas.

C. Members of Faculty, Rank and Compensation:

Professors:	Compensation 1968-1969
Elo Joe Urbanovsky, Chairman	$26,000.00(a)
Donald Ashdown	14,000.00
Charles E. Doell	4,100.00(b)
George O. Elle	14,600.00
L. B. Houston	-0- (c)
Conrad Wirth	-0- (c)
Associate Professors:	
Ellis Wright Huddleston	13,200.00
James William Kitchen	13,200.00(d)
George Tereshkovich	12,755.00
Emmanuel Theodorus G. Van Nierop	13,150.00
Edward William Zukauckas, Jr.	15,600.00(e)
Assistant Professors:	
Malcolm George Bishop	4,000.00(f)
Thomas Alec Musiak	9,600.00
Robert Rentoul Reed	9,000.00
Charles Richard Ward	11,400.00

(a) For 12 months. (Also a Horn Professor.)
(b) Adjunct Professor; approximately one-fifth time.
(c) Adjunct Professor.
(d) Also on the budget for Care and Maintenance of Grounds. Total salary for 12 months, $17,200.00.
(e) For 12 months.
(f) Approximately 28 per cent time for 12 months. Also in the Physical Plant at a salary of $10,500.00 for 12 months. Total salary for 12 months, $14,500.00.

C. Members of Faculty, Rank and Compensation: (Continued)

Instructors:

Bill Aubrey Chevalier	7,900.00

D. Research Activities

1. Park Administration

An interdisciplinary research program has resulted in a successful graduate program. Not only does the Department actively support research assistance from other departments within the University, but also supports research and works cooperatively with other institutions.

Texas Technological College is one of several universities in the United States which is qualified to conduct research in the field of Park Administration. Research areas which need intensive investigation in Texas include: (a) quantitative and qualitative techniques for gathering data on the need and impact of parks, (b) statistical surveys, (c) identification and features of outdoor recreation, (d) management and administration of recreation resources, (e) outdoor recreation users and activities, (f) values and benefits of outdoor recreation, both economic and social, and (g) user-resource-activity relationships.

Accomplishments of past research projects in Texas State Parks and Research in Texas History have included several presentations and publications. Funds have been made available to the Department each year since 1962 from line item appropriations of the Texas State Legislature for research in the area of resource development and in particular for Texas State Parks. Significant changes in the administration and operation of State Parks have occurred since research results were reported as a result of the first project and the interim since 1962. Improvements have included increased operating budgets, the hiring of professional personnel and development of a land acquisition program for State Parks. After the presentation of the results of the most recently completed project for the legislature, "A Tourway Proposal for South Central Texas," the Governor appointed a five-member committee to determine

the feasibility of tourways within the State of Texas. Subsequent to the committee's study and recommendations, 10 Trailways have been designated and marked throughout the State. Interpretative maps have been published and are now available through the Texas Tourist Development Agency.

2. Horticulture

a. Fruits and Vegetables

Organized research in vegetable crops has been conducted since 1960 at Texas Tech College. Research in this field has been primarily applied research aimed at solving some of the cultural problems encountered in a semi-arid climate where irrigation is a basic requirement. The need for this type of research can be well justified on the basis of an annual commercial vegetable acreage of some 30,000 to 50,000 acres on the High Plains. This amount of acreage generates between $15 to $45 million dollars at the farm level.

Active research projects in vegetable crops are currently being supported through funds from Texas Tech Organized Research, Appropriations for Agriculture Research from state funds and from grants from industry. These projects fall into two categories: (1) varietal adaptation studies and (2) chemical herbicide and growth regulator studies. The major objective of both projects is the improvement of quantity and quality of the major vegetable crops through controlled and improved cultural practices within the plant's environment.

Active and supported research in fruit was initiated in 1968 primarily to investigate possible agricultural crops that would lend themselves to a more diversified agricultural production program on the High Plains.

A vineyard consisting of 15 varieties of juice type grapes was established in 1967 and a small peach orchard consisting of 24 varieties was established in 1964 on the Horticultural Farm.

An apple and pear orchard will be established either in the fall of 1968 or the spring of 1969. This project will consist of a high density plant populations of dwarf trees under maximum cultural control.

The future of fruit research will depend on the relocation of the Horticultural Farm due to the construction of the museum complex on the present farm site.

b. Ornamentals

Research activity in ornamental plants is primarily concerned with the breeding and evaluation of garden chrysanthemums for the South Plains and the Southwest. Objectives of this program are to develop garden type chrysanthemums adapted to south plains conditions, to gather and evaluate basic genetic data and to disseminate plants for public use through members of the trade. The Department participates in the All-America Selections of the various ornamental and vegetable crops. The Department also secures plants from the National Arboretum for evaluation purposes and for use as teaching aids in the beginning horticulture course and in plant materials.

3. Entomology

a. Evaluation and Adaptation of Materials and Methods for Cotton Insect Control.

Objectives: 1) to evaluate insecticides, timing schedules, application machinery and methods for more effective control of cotton insect pests in this area; 2) to study the ecology of cotton insect pests and relate this to control; 3) to evaluate beneficial insects and their integration into the over-all control program.

b. Biology and Control of the Sorghum Midge

Objectives: 1) to evaluate various insecticides for chemical field control of the sorghum midge; 2) to determine residues of insecticides left on grain and stover following control programs; 3) to investigate the life cycle of the sorghum midge and adapt control methods to most effectively kill the midge under High Plains conditions; and 4) to find the nature and extent of burn or phytotoxicity involved with application of chemical control materials.

c. Alternate Methods of Mosquito Control to Reduce Chemical Pollution of Waters for Recharge of the Ogallala Formation

Objectives: 1) to develop effective methods of mosquito control which will reduce pesticide pollution of surface water for irrigation or recharge of the aquifer, 2) evaluate the effects of soil tillage and other methods of weed control on the hatching and subsequent development of floodwater mosquitoes in playa lakes, 3) evaluate the effects of weed control on egg laying and subsequent development on those mosquitoes that lay their eggs on the surface of the water in playa lakes.

d. Effect of High Plains Boll Weevil Control Program on Cotton Quality

Objectives: 1) evaluate cotton quality in an area that has been exclusively subjected to the boll weevil diapause control program for three years, with particular emphasis on the 1967 program; and 2) compare cotton quality for a specific variety in treated and untreated areas under similar environmental conditions.

e. Greenbug Research

Objectives: 1) study the biology and control of the greenbug on wheat.

f. Monitoring Environmental Impact of Pesticide in Boll Weevil Control

Objectives: 1) to determine the immediate effect of the High Plains Boll Weevil Control Program on nontarget insects; and 2) to evaluate the effect of the control program on beneficial and harmful insects populations in the following growing season.

g. Investigations of Insects Associated with Mesquite

Objectives: 1) to collect and identify insects associated with mesquite, 2) to evaluate the potential of insects as possible biological control agents, 3) to establish sampling techniques and methods to be used in future studies; and 4) to collect and identify parasites of insects associated with mesquite.

h. Investigation of Pollutional Effects of Utilizing Playa Lake Water for Recharge of the Ogallala Formation

Objectives: 1) to determine whether or not the utilization of playa lake water for recharge of the Ogallala aquifer is likely to result in significant or permanent damage to water quality in the formation.

i. Establishment of a Collection of Insects of Arid Lands

Objectives: 1) to develop a comprehensive reference collection of insects of Arid and Semi-Arid Lands of the world.

j. Investigations of Insecticides

Objectives: 1) to evaluate new insecticides for control of insects in West Texas.

E. Extension

1. Park Administration - Southwest Park and Recreation Training Institute. Thirteen annual meetings have been conducted by this department in cooperation with the National Recreation and Park Association.

2. Horticulture - Vegetable Field Day conducted in cooperation with Texas A & M University Extension Service. Trial plots of chrysanthemums serve as an important extension service to members of the community. The Horticulture section provides facilities and help conduct an annual flower show.

3. Entomology - Agricultural Chemicals Conference, Pest Control Short Course and Cotton Insect Scouting Short Course are current extension programs of the Entomology section. This section of the Department cooperates with the Texas Agriculture Experiment Station on recommendations for control of economically important insects in Texas.

III. FUTURE PLANS FOR DEVELOPMENT

A. Park Administration--Goals and Objectives

The park administration program of the Department has traditionally emphasized the training of specialists with a broad understanding of principles of design, maintenance and operation of park and recreation facilities. This approach has proven to be effective as evidenced by the excellent reputation the Department has earned among professionals across the nation. Many of its graduates have distinguished themselves in the field while career opportunities in both private and public employment available to park administration graduates invariably exceed the number trained each year.

Despite his technological and scientific ingenuity, man has failed to adapt to the living conditions he has created in the urban and industrial complexes of our modern society. "Man", Professor Rene Dubos of Rockefeller University in New York, remarked recently, "evolved in association with natural forces and civilized as he may be, the natural world is essential to his well-being". This remark underscores a need for the provision of adequate opportunities which will enable man to rediscover his relationship to nature.

The park administrator of today is in a favorable position to exert his influence in guiding the utilization of natural resources of land, water, and open space for the satisfaction of man's psychological and spiritual needs. Through his efforts he can contribute significantly toward resolving the conflicts between man and the world he lives in. It is in this light, therefore, that urban and regional parks, recreation facilities or esthetic development of the landscape must be viewed, rather than merely as places for the spending of leisure time.

Environmental planning and management have emerged as an area of academic specialization and is recognized as such by a number of universities across the nation. It has been the basis for several legislative measures enacted by state and federal governments in recent years. Prospects for a successful implementation of programs for restoration of the environment appear remote; however, unless universities are able to furnish the number of scientists and specialists that will be needed.

Study programs designed for this purpose require a multi-disciplinary approach, involving professional course work in the development, management, and utilization of our natural resources. For many years, park administration majors have been encouraged to avail themselves of courses offered outside the Department to enhance their leadership qualities as administrators. Recently, the Department has expanded its curriculum to provide students with an opportunity to acquire an understanding of planning principles which are basic to the creation of an environment in which the resources of land, water, and people are in a productive and dynamic equilibrium. In addition to the standard courses, the curriculum now includes special problem courses, seminars, and individual research.

Departmental plans for the next decade call for a strenghtening of its park administration program, especially at the graduate level. New courses to be added will reflect the increasing diversification of the park administrator's responsibilities. In general terms, subject matter will deal with the inter-relationship between man and his environment, conservation of natural and related community resources and public policy in natural resource administration. Landscape architecture is to remain a prominent part of the park administration program. However, additional courses in landscape architecture have been proposed for the benefit of students interested in this area of specialization. These changes are recommended to facilitate accreditation

of the Department by the American Society of Landscape Architects. The park administration program will further be reinforced with supporting courses in related subjects such as sociology, economics, history, and the natural sciences. As currently envisioned, the program would enable master's degree candidates to select a sequence of courses suited to his individual needs and interests.

Since its inception, the park administration program has made considerable headway in the application of new teaching methods and ideas, originated by the Department, which have added to its stature among similar institutions elsewhere. The Department has the potential to strengthen its position as a national leader in the training of park administrators and managers who are able to deal effectively with the complex problems of resources and communities. However, a continuous updating of the curriculum will be necessary.

If the profession is to grow in maturity, universities must be prepared to furnish research workers and teachers at the college level to meet the demands of the rapidly growing profession of park administration.

Recognizing its responsibilities in this critical matter, the Department has developed plans for initiating a doctoral program in the not too distant future. A request for authority to offer a program leading to the Doctor of Philosophy degree has recently been approved by appropriate university authorities. The proposed program will be multi-disciplined in nature and candidates will be expected to submit a dissertation on an independent and original research project in park administration or related subject matter.

To implement this new academic program, the Department will need to supplement its permanent teaching staff and physical facilities. A detailed estimate of the additional requirements, listed below, are considered adequate to assume the increased responsibilities to which the Department is committed.

Office Space

3 Professors - 10' x 12'	360 square feet

Study Carrels for Graduate Students

15 Graduate Students - 5' x 8'	600 square feet
1 Secretary - Space 5' x 8'	40 square feet
1 Graduate Seminar Room and Classroom Space - 30' x 40	1,200 square feet
1 Sound Proof Room for Recording and Developing Slide Presentations Space - 10' x 10'	100 square feet
1 Storage Space - 5' x 10'	50 square feet
Total Specialized Space Required	2,350 square feet

Personnel

Initial First Year Costs	Institutional	Other Financial Assistance
3 Assoc. Prof. - 9 months	$24,000.00	
3 Assoc. Prof. - 3 months		$12,000.00
Secretary III		4,740.00
Library		500.00
Office Space, Teaching and Associated Space, 2,350 square feet	- - - -	
Office Equipment	2,500.00	
Maintenance, Equipment, and Travel	- - - -	1,500.00
Total	$26,500.00	$18,740.00

The above budget request indicates three additional Associate Professors. A portion of funds indicated from "other financial assistance" would be available from research projects. Other research projects can be developed to support summer employment, secretarial assistance, library acquisitions, and maintenance, equipment, and travel.

Additional funds for the increased activity level of the Department of Park Administration would be required in the overall maintenance, equipment, and travel budget. It is estimated that for three additional teaching personnel and one secretary, approximately $1,500 would be needed to finance increased needs in maintenance, equipment, and travel.

Additional office furniture and office equipment for proposed personnel would be required. Estimated cost would be $2,500 for these additional items.

B. Horticulture

Teaching

A vital function of the horticulture section is its development and conduct of teaching programs at both the undergraduate and graduate level. This section thus fulfills its obligation to the people of the state and nation by providing highly-trained, well-qualified, young men and women for positions in industry, teaching, research, and extension activities. This function can be accomplished through a vigorous program of public relations, recruitment, and a teaching par excellence.

Today the need for well-qualified individuals in all phases of horticultural endeavors and those providing related services is critical. As our population (rural-urban) expands and becomes more affluent, its future needs for horticultural information services (both basic and applied), and products must be met. Also, since young people are potential customers of the future, the information they gain and the skills they develop can be used in maintaining home and garden plantings and should aid in increasing the sale of horticultural products in the future.

The prerequisite for fulfilling these needs is a sound teaching program for the student. This student will have had practical field and greenhouse experience and a basic background in botany, chemistry, genetics, soils, and his chosen horticultural specialty.

The foundation of the horticulture section's teaching program lies in its total student enrollment of both departmental majors and students outside the Department (service function). To overcome low horticultural course enrollment, it will be the responsibility of the members of the Department to take certain steps, namely through membership in civic organizations, speaking engagements, and radio and television programs to emphasize the importance and

opportunities in horticulture. In addition, cooperation with the State Department of Education, a close relationship should exist between high school guidance counselors and the Department relating the opportunities offered in horticulture. This is only a token effort and the whole problem of recruitment of horticultural students should receive serious thought.

In view of possible increases in enrollment with students possessing broad horticultural interests, it is recommended that new courses in the horticultural curriculum be offered to present a more balanced program. The following is recommended:

Undergraduate: General

1. Post-harvest physiology, handling and storage of fruits and vegetables
2. Small fruit and nut culture
3. Nutritional requirements of horticultural plants
4. Nursery management practices

Graduate

1. Breeding of horticultural crops
2. Fruit and/or vegetable physiology

Research: Vegetables

Charles Allen Thomas wrote in his Retreat for Progress, "Science is always changing--new knowledge, like growing plants, develops within itself the seeds of its own change." Almost as much progress has been made in farming during the past 60 years as was made in the previous 2,000 years. This agricultural progress is due to the effect of increased productivity per acre, mechanization, larger farms, and greater specialization. The increased productivity per acre is due mainly to improved varieties and better cultural practices--factors with which horticulturists are most intimately concerned.

What does the future hold for the horticulture segment of agriculture? Small fruit and vegetable farms of the market-garden type are giving way to fewer and larger farms. The trend is toward much larger capital investments, specialization on fewer crops, greater skills and efficiency in use of labor and scientific knowledge. Foods requiring considerable preparation in the home or restaurant before consumption are declining in use. The per capita consumption of canned, frozen, and dehydrated products is increasing sharply. The sale of frozen fruits and vegetables has increased about three-fold in the past ten years. Revolutionary changes in processing, packaging, distribution, and marketing have forced even greater emphasis on quality and uniformity of the raw product.

What are the research needs to meet this demand for raw horticultural products required by the public and processors.

The needs and problems listed may be grouped into five major categories: (1) weed control, (2) mechanical harvesting, (3) plant growth and development, (4) plant breeding, and (5) disease and insect control.

Weed Control:

Weed control research is needed in practically all vegetable crops. The most urgent need is in the area of applied research--the testing of chemicals and methods of application for effective weed control--to study herbicidal action, and residue problems on vegetables grown for processing.

Mechanical Harvesting:

The use of mechanical harvesters is present or imminent for all vegetable crops and necessitates the investigation and development of suitable cultural systems to produce vegetable crops for these machines. Entirely new requirements have been imposed on every aspect of crop culture. Research is needed

which takes into consideration all phases and implications of varieties and culture (precision seeding, plant spacing, growth regulators, mineral nutrition, predicting of maturity dates, and weed, insect and disease control) as a unified cultural system.

Plant Development and Growth:

This area of research may be subdivided into three phases: (1) environmental effects, (2) mineral nutrition, and (3) alteration of growth and development by chemical and cultural methods.

Studies on effects of temperature, light, soil moisture, and photoperiod on vegetative growth, fruit set and fruit development are needed. These studies are necessary to establish planting and harvesting schedules. The effect of low temperature on plants during early stages of growth should be studied.

Responses to mineral elements as related to vegetative growth, flowering, and fruit set should be investigated.

Basic studies on phases of plant growth and development, including vegetative growth, flowering, fruit set, fruit development, apical dominance, senescense, abscission, sex expression, and photoperiod, are needed. These should include studies with growth regulators such as auxins, kinins, gibberellins, growth inhibitors, and growth retardants.

Breeding:

Emphasis in breeding programs should be on the development of high-yeilding, disease-resistant varieties adapted to mechanical harvesting. The development of new varieties is related to all other disciplines and will require much of the same equipment for evaluation of breeding lines for various characteristics and qualities.

Disease and Insect Control:

Horticulturists should be able to define the insect and disease problems requiring research priority and should cooperate with plant pathologists and entomologists in control studies.

More effective insecticides and fungicides and improved application methods are needed in certain crops. Research on the chemical control of plant viruses should be considered.

Research: Fruits

The south, southeast and southwest losses of deciduous fruit crops due to late spring frost and freezes is a problem associated with the fact that the rest requirement of these crop plants is not thoroughly understood. Therefore, we have no way of controlling it. Frequently the cold requirement of peaches, apples, pears, etc., is satisfied early in the winter. Due to frequent warm days during late winter, they start to grow and become very susceptible to cold injury. Research is needed on elucidating the mechanism of rest in deciduous fruits and methods of controlling this by chemical means.

Possibly another area of research which needs attention is that of increasing the biological efficiency of the production of tree fruits. As good productive land becomes scarce, there will be a greater demand for high production per acre. This can probably be brought about by closer spacing, higher fertility levels, newer and better adapted varieties and definite methods by which growth of the plant can be controlled.

All production research should be adjusted to economic production of the best quality fruit possible which will return a fair profit to the grower for his expenditure of time and capital. Several phases of research should possibly be considered for the plains area of Texas: (1) environmental effects,

(2) plant growth and development, (3) weed control, (4) mechanical harvesting, (5) disease and insect control, and (6) post-harvest physiology:

(1) Environmental Effects

(a) Temperature - Low temperatures are responsible for losses of trees and crops. Attempts are being made to modify the microclimate around trees and also to condition the tree to temperature extremes through manipulation of cultural practices. A great deal more effort should be expanded to discover growth retardants, especially those that delay flowering since severe crop losses occur almost annually somewhere in the southern part of our country's fruit producing areas.

(b) Light - High density fruit plantings which will increase production per acre, could improve quality, and reduce production costs. Such plantings can only be successful if they are so pruned that leaf surface receives the maximum light intensity possible. Compact, smaller, less dense trees with more of the leaves exposed to direct sunlight, and with greater square footage of foliage per acre will give increased production and higher quality of individual fruits. Research on this subject will certainly be needed for the plains area.

(2) Plant Growth and Development

With the development of compact trees and high density plantings, plant growth will have to be carefully controlled. Pruning and fertilizing to keep these trees in balance will actually mean controlling vigor. This will require a high degree of horticultural skill. The development of this skill must be preceded by considerable research in the best methods of handling these high density orchards for efficient production.

(3) Weed Control

Almost all fruit crops need some economical method of weed control. Cultivating of fruit crops is a practice which is rapidly becoming outmoded because of the expense involved and possible damage to the tree's root system. Chemical weed control, but not soil sterilization, around the trees will probably be the most satisfactory method. Considerable research with the various fruit crops to determine the proper timing, chemicals, or combinations of chemicals will have to be done. Along with this, the long-term effects of the trees and residue build-up in the soil will probably have to be given study, as well as the effect on storage and shelf life of the fruit.

(4) Mechanical Harvesting:

It is the desire of every grower and many researchers that a mechanical harvester may be developed that will eliminate the greater part of harvest labor. At the present stage of development, these machines are only suitable for the harvest of processing crops. It is quite doubtful if we will have equipment in the near future capable of harvesting soft fruits. This appears to be several years away and will depend on some new method not yet apparent. With labor costs increasing, fresh fruit in the future may well become a luxury product with processed fruits being used by the majority of the people. Machine picking of fruit such as peaches, apples, grapes, and berries is already with us. As yet, the machines are expensive. They need to be simplified and reduced in price.

(5) Disease and Insect Control:

Horticulturists should be able to define the disease and insect problems requiring research priority and should cooperate with plant pathologists and entomologists in control studies. More effective insecticides and fungicides and improved application methods are needed in certain crops.

(6) Post-Harvest Physiology:

If the demand for fresh fruit in the nation is to continue, it is essential we attempt to learn to maintain quality of fruit after harvest. It would be an advantage if methods could be devised to reduce respiration and maintain high quality. In addition, new and better containers which would reduce damage to the crop during transit probably need to be developed.

Proposed Changes for Freshman Horticulture

The majority of the American population now lives in metropolitan areas and this percentage is predicted to increase substantially in the immediate future. Current trends toward urban renewal reflect a need for improvement of living conditions in the nation's communities. The creation and utilization of open space is an integral part of modern city planning which horticulturists and landscape designers will assume a prominent role.

Techniques which can be employed to enhance the quality of urban environment have been taught by the Department for several years as a part of its horticultural curriculum. The formal course, Horticulture 131, is designed

primarily for freshmen and is required for all students within the School of Agricultural Sciences and is elected by many students majoring in other fields.

The principal source of students for Horticulture 131 during the last term was from the School of Business Administration while the Schools of Agricultural Sciences and Home Economics followed closely behind. It is anticipated that enrollment of non-agricultural majors will continue to grow. Registration for this course during the 1967-1968 academic year totaled 895, an increase of almost 70 percent over the 1960 figure.

To cope with increased enrollment, it is imperative that new methods be devised to maintain an effective program of instruction without an extension of the regular teaching staff.

Proposed changes include increasing class sizes to lecture sessions of approximately 200 students. Present laboratory enrollment would be increased from 25 students per laboratory section to 40 students. The course would be reorganized and would be developed to maximize the use of all forms of visual aids for lecture and laboratory sessions.

At the present time visual aids in the form of models, slides projected through 35mm projectors, over-head projectors and living plant materials are utilized. Proposed additional visual aids would include 16mm film, individual film strips and the use of Texas Technological Education Television facilities. In reorganization, new visual aids would be developed to follow a reorganized syllabus. A portion of some lectures and appropriate laboratories would be placed on tape for future programming through the television station to lecture and to laboratory rooms.

The estimated cost of implementing these changes is approximately $36,000.

Anticipated Needs

Anticipated increased enrollment will necessitate increased professional staff members for teaching and research assignments. Additional office space, greenhouse space and equipment will be necessary to meet the proposed expanded program.

C. Entomology - Future Plans for Development

The over-all goal of the entomology program is the development of a well-rounded program for undergraduate and graduate training and performance of research worthy of national and international reputation. The nucleus for the achievement of these goals is present and, with the support of the administration, these goals can be achieved. The following sequence of development appears, at the present time, to offer the most promise:

(1) Begin to achieve national and international repute by the establishment of a collection of the insects of the arid and semi-arid lands of the world in cooperation with the ICASALS museum. Space for the collection, salary for the director of the collection, and a certain amount of support are necessary. This will also immediately strengthen current work in insect taxonomy.

(2) Concurrent with collection activities, a laboratory science service course must be developed to build the teaching load needed to support additional staff. This, together with the anticipated increase in enrollment, should support the projected staff increases.

(3) By effective utilization of state, federal, and private research support, additional staff positions can be created to speed the development of the program.

A. Five Year Plan

1. Departmental Status--a separate Entomology Department should be created in 1969.

2. Enrollment
   a. Undergraduates--100
   b. Graduates--15

3. Faculty and Staff Requirements
   a. Insect taxonomist, assistant professor, needed in 1969
   b. Director for arid and semi-arid lands collection, professor, needed immediately
   c. Insect toxicologist, assistant professor, needed in 1970.
   d. Full-time secretary, needed immediately.
   e. Curator of collection, B.S. level, needed in 1970

4. Undergraduate Programs
   a. A new B.S. program in Pest Management. A proposed consortium with the School of Tropical Agriculture, University of Hawaii will be pursued to develop world-wide status in Pest Management. This will require new courses in this area.
   b. A new laboratory science service course will be developed in cooperation with other Schools. The Department will work closely with the School of Education and the Biology Department to provide science teachers with an Entomology emphasis.

5. Graduate Programs
   a. Specialization in Insect Taxonomy and Biological Control as soon as faculty are available.
   b. Offer Ph.D. in 1973.

6. Research
   a. Expanded work on Ecology of Playa Lakes with emphasis on the encephalitis problem.
   b. Expanded research on biological control of brush
   c. Establishment and enlargement of a collection of insects of the arid and semi-arid lands of the world.
   d. Expand investigations on the pollutional effects of utilizing playa lake waters for recharge.
   e. Expand investigations on the biology and economics and public health importance of West Texas insects.

7. Extension
   a. Continue programs in Agriculture Chemicals Conference, Pest Control Short Course, and Cotton Insect Scouting Short Course.
   b. Continue an expansion of cooperation with Texas Agriculture Experiment Station on recommendations for control of economically important insects in Texas.

8. Additional Space Requirements
   a. Office space
      1) Faculty, 3 offices, (2 may be in ICASALS Museum)
      2) Graduate students, space for 10 additional students
   b. Insect collection (may be in ICASALS Museum)
      1) 2,000 square feet of floor space
      2) 15 feet x 20 feet fire proof vault for type specimens
   c. Field laboratory, 20 feet x 30 feet
   d. Field storage space, 30 feet x 60 feet (including 10 x 10 cold storage).

e. Laboratory Facilities
   1) Insectory, 20 feet x 40 feet
   2) Insect toxicology and physiology laboratory, 20 x 30 feet

B. Ten Year Plan

1. Enrollment
   a. Undergraduates--150
   b. Graduates, M.S., 20; Ph.D., 10.

2. Additional Faculty and Staff
   a. Pest Management Specialist, assistant professor needed by 1973.
   b. Biological control, and insect pathologist, assistant professor, needed in 1974.
   c. Insect taxonomist, assistant professor, needed in 1975
   d. Research technician, B.S. level, needed in 1974
   e. Full-time secretary needed in 1974.

3. Undergraduate Program--no new undergraduate programs are foreseen.

4. Graduate Program--Expanded Ph.D. offerings as faculty increases

5. Research
   a. Continued emphasis will be placed on the areas of research as indicated in the Five Year Plan
   b. Every effort will be made to involve all faculty in part-time research appointments.

6. Extension
   a. We will continue to attempt to meet the needs of the area.
   b. Special courses will be offered in pest control, mosquito control, etc.
   c. Provisions for training courses for ICASALS foreign oriented students will probably be needed.

7. Space Requirements
   a. Office Space
      1) Office space for 15 additional graduate students
      2) Office space for 3 additional faculty
      3) Office space for visiting scientists on sabbatical, U.S.D.A. cooperators, etc., at least two offices.
   b. Insect collection--an additional 1,000 square feet of floor space.
   c. Laboratory Facilities
      1) Ecology laboratory
      2) Isolation and quarantine facilities for introduced insects for biological control.

DEPARTMENT OF

RANGE AND WILDLIFE MANAGEMENT

THE
HISTORY, CURRENT STATUS, AIMS AND OBJECTIVES
OF THE
RANGE AND WILDLIFE MANAGEMENT PROGRAM
TEXAS TECHNOLOGICAL COLLEGE
LUBBOCK, TEXAS

1968

Resume

Range Management instruction emerged as a program in the Agronomy Department in 1958. The first B.S. degree in range management was awarded in 1962. A total of 61 B.S. and 8 M.S. degrees have been awarded since inception.

Tech now has the largest range management program in the U.S. with 111 undergraduates and 15 graduate students enrolled during the spring semester of 1968. A wildlife emphasis was added to the program in 1966, and wildlife students now make up about 30% of the enrollment.

The offering of a B.S. and M.S. in wildlife with emphasis on habitat management and a Ph.D. program in Range Science is expected in the near future. The proposed separation of the range and wildlife program from the Agronomy and Range Management Department will enhance development of the needed programs.

The present staff consists of eight on campus range and wildlife professors, seven of which have the Ph.D. In addition five internationally known scientists are available for consultation and review.

Available housing for staff members is filled to capacity and provisions must be made for future expansion. The same is true with teaching facilities. Especially designed laboratory facilities are needed for both teaching and research.

Objectives for the next five years are to continue developing a strong undergraduate and graduate teaching program in range and wildlife management while increasing our research activities. To meet these objectives we need departmental status, a B. S. and M. S. in wildlife management, and a Ph.D. in range science.

Ten year objectives include curricula in fisheries, watershed, forestry and outdoor recreation.

HISTORICAL BACKGROUND

Origin and Development of the Department.

Range management at Texas Technological College developed as a joint program between Animal Husbandry and Agronomy in the early nineteen-forties. Range plants and the principles and practices of range management were the only range courses offered.

In the early nineteen-fifties the entire program was transferred to Agronomy and another course was added in order to qualify students as range conservationists. Range management was listed as an option in Agronomy at that time.

In 1958 John R. Hunter was hired to teach range management and freshman agronomy. The enrollment began to increase and the range management program developed rapidly. By 1962 there were forty majors in range management and the need for another staff member. Dr. Thadis W. Box was hired to help develop a graduate program in range management in September 1962, and the first graduate student was enrolled that fall. By 1963 range management was a major rather than an option and the enrollment continued to increase.

Another staff member, Dr. Joseph L. Schuster, was hired in January 1964. Dr. Schuster, an ecologist, greatly strengthened the graduate program. Enrollment in the wildlife course initiated in 1962 created the need for a staff member to develop a wildlife program. Dr. Eric G. Bolen was hired in the fall of 1966 as the first wildlife ecologist.

Since that time three more members have joined the staff. Dr. Henry A. Wright in April 1967; Dr. Bill E. Dahl in the fall of 1967; and Dr. Donald A. Klebenow in January of 1968. Dr. Wright and Dr. Dahl are range ecologists and Dr. Klebenow is a wildlife ecologist specializing in wildlife habitat.

Presently, the range and wildlife program at Texas Tech is the largest in the nation, having an enrollment of 111 undergraduate and 14 graduate students during the 1968 spring semester.

Most of the recent growth has been in the wildlife program. Tech's wildlife program is unique in that it is habitat oriented and qualifies the student to work as both a range conservationist and/or a wildlife biologist.

Enrollment in Range and Wildlife Management Program

Student enrollment in range and wildlife management program for period 1959-1968, is as follows:

	1962	1963	1964	1965	1966	1967	1968
Undergraduate	40	53	64	78	98	100	111
Graduate	1	3	6	5	7	9	14

Undergraduate enrollment for 1967-68 school year was approximately 70% range majors and 30% wildlife option students. A list of course offerings and enrollment is presented in Table 1.

Degrees Awarded

The number of undergraduate and graduate degrees awarded in range management through 1967 is as follows:

	1962	1963	1964	1965	1966	1967	Total
Undergraduate	6	9	9	8	13	16	61
Graduate	0	0	0	2	3	3	8

1962 was the first year range management was recognized as a separate major.

Table 1. Enrollment in Range Management Courses 1959-1967.

	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68
RM 231	-	-	62	63	62	105	210	250	273
RM 232	-	-	-	-	-	-	-	-	28
RM 331	-	-	-	-	-	-	-	49	88
RM 332	-	-	-	15	18	22	24	13	12
RM 410	-	-	-	-	-	-	19	14	12
RM 430	-	-	-	-	-	-	10	7	7
RM 431	-	-	-	-	-	12	15	22	27
RM 333	50	51	69	83	70	64	56	41	46
RM 432	-	-	6	12	15	18	12	14	9
RM 433	-	-	-	-	-	-	-	-	8
RM 435	-	-	-	-	-	-	-	-	10
RM 437	11	14	25	26	35	28	21	25	21
RM 438	8	12	14	11	18	19	20	18	11
RM 510	-	-	-	-	-	-	18	14	13
RM 521	-	-	-	-	-	-	7	10	8
RM 523	-	-	-	-	-	7	9	6	9
RM 531	-	-	-	-	7	5	9	6	6
RM 532	-	-	-	-	5	5	9	7	10
RM 534	-	-	-	2	5	10	15	13	11
RM 631	-	-	-	-	5	17	14	9	6

Instructional Staff Since Inception.

The instructional staff in range management since the inception of the program is as follows:

1958 - Dr. Gerald W. Thomas, Range Management
1958 - Mr. John R. Hunter, Range Management
1962 - Dr. Thadis W. Box, Range Management
1964 - Dr. Joseph L. Schuster, Range Management
1966 - Dr. Eric G. Bolen, Wildlife
1967 - Dr. Henry A. Wright, Range Management
1967 - Dr. Bill E. Dahl, Range Management
1968 - Dr. Donald A. Klebenow, Wildlife

Except for Dr. Thomas' position as Dean of Agriculture and Dr. Box's tenure as Director of ICASALS not one staff member has left the program since its inception.

Publications.

The present staff has published more than 136 publications since 1958. This represents a significant contribution to the field of range and wildlife management during a six year period. A list of publications by each resident staff member is given in appendix A.

Departmental Budget.

The budget for the Agronomy and Range Management Department for the period 1958 to 1968 is as follows:

For Year Ending	Salaries	Operating Expenses	Capitol Outlay	Total
1958	$45320.00	$ 1651.14	$ 215.49	$47186.63
1959	47970.00	1378.88	281.94	49630.82
1960	49303.85	2675.24	1170.50	53149.59
1961	54524.55	3236.87	57.23	57818.65
1962	59020.00	7241.98	4699.26	70961.24
1963	65401.50	8401.29	1938.44	75741.23
1964*	8.541.41	7172.74	2191.96	90906.11
1965	100425.90	11152.24	1712.03	113290.17
1966	120613.35	8644.44	4238.90	133496.69
1967	143202.99	10458.61	2372.29	156033.89
	$767,323.55	$62,013.43	$18,878.04	$848,215.02

* Changed to: Department of Agronomy and Range Management

CURRENT DEPARTMENTAL STATUS

Teaching

The primary emphasis of the range and wildlife program is the development of well trained undergraduates in range management and wildlife habitat. Emphasis is placed on the undergraduate program but due to the interest and enthusiasm of the faculty in research a strong graduate program is developing. A master of science degree in range science with emphasis in range or range-wildlife is now offered. A Ph.D. program in Range Science and a Master of Science program in wildlife management is anticipated in the near future. Separation of this program from the present Agronomy and Range Management Department is also anticipated in the near future.

The present teaching staff consists of Dr. J. L. Schuster, range management acting as section leader; Mr. John Hunter, range management; Dr. Eric G. Bolen, wildlife management; Dr. Henry A. Wright, range management; Dr. Bill E. Dahl, range management; Dr. Donald A. Klebenow, wildlife management. Dr. Gerald W. Thomas, Dean of Agriculture and Dr. Thad Box, Director of ICASALS also teach when their time permits. Mr. Jimmy Brown, range management, is research associate in the Brush Control program.

Other range and wildlife staff members who contribute to teaching and research program either as consulting or adjunct professors are: Dr. R. A. Darrow, consulting professor in range management; Dr. Clarence Cottam and Mr. Caleb Glazener, adjunct professors of wildlife management; Dr. Martin Gonzales and Dr. W. J. Waldrip, adjunct professors of range management.

Research Activities

Research is carried on by staff members through individual studies and through graduate student participation in the staff members projects. Monies for research are obtained through grants from federal or private agencies and from State appropriated research monies.

Research is conducted on college owned rangeland on campus, the Texas Tech Research Farm near Amarillo, and on cooperating privately owned ranches. Through written agreements with ranchers over 400,000 acres of rangeland are available for the conduct of on ranch research. Many of the ranchers contribute financially to the research through monies for assistantships, equipment and materials.

Presently emphasis is placed on range improvements including brush control, reseeding, grazing management, waterfowl management and upland game habitat. The primary research projects now in progress are listed in Appendix B. A total of 40 projects with one or more studies in each are currently in progress (Appendix B).

Current Enrollment

Enrollment in the Range and Wildlife Management Program for the school year 1967-1968 is as follows:

	Fall 1967	Spring 1968
Freshmen	30	34
Sophomores	29	32
Juniors	26	24
Seniors	19	21
Graduates	11	14

Enrollment by courses for current year (1967-1968) is shown in Table 1. A total of 615 students were enrolled in 20 courses offered by the Range and Wildlife Staff during 1967-1968 school year.

Current Range and Wildlife Management Faculty (Spring 1968)

There are presently thirteen faculty members associated with the range and wildlife management program. Their rank and primary duties are as follows:

Faculty Member	Duties	Compensation
Dr. Gerald W. Thomas, Prof. of Range Mgmt. & Dean of Agriculture	Admin.;Teaching	
Dr. Thadis W. Box, Prof. of Range Mgmt. and Director of ICASALS	Admin.;Teaching	
Dr. Joseph L. Schuster, Assoc. Prof. of Range Mgmt.	1/2 Teaching; 1/2 Research	
Dr. Billie E. Dahl, Assoc. Prof. of Range Management	1/2 Teaching; 1/2 Research	
Mr. John R. Hunter, Assoc. Prof. of Range Mgmt.	Teaching	
Dr. Eric G. Bolen, Asst. Prof. of Wildlife Mgmt.	Teaching	
Dr. Henry A. Wright, Asst. Prof. of Range Mgmt.	1/2 Teaching; 1/2 Research	
Dr. Donald A. Klebenow, Asst. Prof. of Wildlife Mgmt.	1/2 Teaching; 1/2 Research	
Dr. Robert A. Darrow, Consulting Prof. of Range Mgmt.	Consultant	
Dr. Martin Gonzales, Consulting Prof. of Range Mgmt.	Consultant	
Dr. Clarence Cottam, Adjunct Prof. of Wildlife Mgmt.	Consultant	
Dr. William Waldrip, Adjunct Prof. of Range Mgmt.	Consultant	
Mr. Caleb Glazener, Adjunct Prof. of Wildlife Mgmt.	Consultant	

Space Available to Range and Wildlife Management Program, Spring 1968

The total space available for the Range and Wildlife Management program is tabulated below:

Facility	Sq. Ft. of Space
1. Office (Hunter) 225B	105
2. Office (Bolen) 225A	105
3. Office (Brown) 224A	82.5
4. Office (Schuster) 227B	186 plus 1 closet
5. Office (Klebenow) 224B	92.5
6. Office (Dahl) 224C	99.8
7. Office (Wright) 224D	97
8. Office (Secretary: Harrison) 227A	121 plus 2 closets
9. Office (Secretary: Stevens) 224	96
10. Seminar and Conference Room 226	236.5 plus 1 closet
11. Anteroom and Storage (Bolen & Hunter) 225	98 plus 1 closet
12. Storage Room 106	60

There is an average of 109.7 sq. ft. of space for each faculty. This includes 186 sq. ft. for section leader's office. There is no space available for new faculty.

Current Departmental Budget

The Range and Wildlife Management program is currently funded as part of the Department of Agronomy and Range Management. The 1967-1968 budget for the Agronomy and Range Management Department is as follows:

Staff salaries	$160,174.00
Maintenance, Equipment and Travel	$12,900.00
Agronomy Farm	$ 8,050.00
TOTAL	$181,124.00

The Range and Wildlife Management Section budgets make up about 40% of the staff salaries and M, E, & T. Monies for research from grants and state appropriated research are not included. These vary in amount but totaled over $120,000 in 1967-1968.

OBJECTIVES AND GOALS FOR THE NEXT FIVE AND TEN YEARS

Our objectives for the next five years are to continue developing a strong undergraduate and graduate program in range and wildlife management while increasing our research activities. Our emphasis in teaching and research will be in arid lands to fill the need for specially trained scientists on arid and semi-arid lands and to help meet the stated goals of the College.

To meet these objectives we need departmental status, a B.S. and M.S. in wildlife management, and a Ph.D. in range science within the next five years.

Ten year objectives include curricula in fisheries, watershed, forestry and outdoor recreation. Anticipation of these programs is based on the fact that range and wildlife management are closely allied with these natural resource fields. In fact, range management and wildlife habitat management are unique in that they use both animal and plant science. They are based on the ecology of both plants and animals. Any management of the range resource must consider animal yields both wild and domestic. Both fields deal with the use of submarginal agricultural lands. Total or complete use of these lands means multiple use. For example, a given piece of land can be used by wildlife, domestic animals, for forest products, as a watershed and for recreation. Because the present range and wildlife program is closer to these fields than any department on campus we feel that future expansion will include forestry, watershed and outdoor recreation.

We plan to employ research minded educators with keen interests in both teaching and research. If monies are available each professor will be encouraged to research at least 1/2 time in his speciality. Major emphasis in range will be in range ecology and range improvement research. Within the next five years the newly established brush program should be fully productive. Range revegetation and fertilization studies will be expanded at the Pantex Research Farm. Wildlife studies in the next five years will include life history studies of arid and semi-arid land species, and habitat requirement and improvement studies. Within 10 years we hope our research will answer questions concerning an integrated program of livestock, wildlife, fisheries, recreation, watershed and forestry for arid and semi-arid climates.

Timetable For Degree Program

1968-1969. An undergraduate curriculum in wildlife management. The program will be strongly habitat oriented.

1969-1970. A master of science in wildlife management and a Ph.D. in Range Science. Range ecology will be the basic course but programs will develop according to individual interests.

1970-1971. A B. S. in fisheries management. The program is needed because none is available in west Texas and the plains area. A M.S. in fisheries should also be made available.

1971-1972. A Ph. D. in wildlife management. By then staff and equipment will be such that a program will be easily established with existing personnel.

1973-1978. Curriculum in other renewable natural resources will be developed.

Expected Enrollment

In five years (1973) undergraduate enrollment will exceed 150 and graduate enrollment will exceed 25.

In 10 years (1978) undergraduate enrollment will exceed 175 students and graduate enrollment should exceed 33 students.

This prediction is based on recorded growth since initiation of the program and observation of similar programs at other institutions.

Likewise, enrollment in course offerings by the department will increase. Tables 2 and 3 give estimates of enrollment in approved (Table 2) and proposed (Table 3) courses until 1978.

Faculty Requirements

Range Personnel

The range management program, developing rapidly at the master's level, is shortly to initiate broad-based research leading to the doctorate. The department's current involvement with major studies, primarily in the area of brush management, is an important stepping stone in this direction. Detailed, long-range studies will be conducted. Faculty needs will be largely directed to research scientists equipped to maintain and supervise this work. Specifically, the following positions must be filled:

Table 2. Projected class growth for approved range and wildlife courses for 10 years.

COURSE	68-69	70-71	71-72	72-73	73-74	74-75	75-76	76-77	77-78
RM 231	300	330	340	350	360	360	370	380	390
RM 232	38	58	78	98	108	130	145	160	170
RM 331	90	98	105	115	115	120	120	125	130
RM 332	30	33	36	40	44	48	52	56	60
RM 333	50	55	60	65	70	75	70	70	75
RM 337	25	27	30	33	36	40	44	48	50
RM 410	14	16	19	22	25	29	33	37	40
RM 430	12	13	14	15	17	19	21	23	25
RM 431	29	31	33	35	37	40	43	46	50
RM 432	12	14	16	19	22	25	28	32	35
RM 433	10	11	13	16	20	22	25	27	30
RM 434	10	12	14	16	20	22	25	27	30
RM 435	13	15	17	20	23	25	27	30	33
RM 438	23	27	30	33	36	40	44	48	50
RM 510	26	30	34	36	40	40	40	40	40
RM 511	20	25	35	36	40	40	40	40	40
RM 521	9	10	11	12	13	14	15	17	20
RM 523	11	12	13	14	15	16	18	20	20
RM 531	9	12	13	14	15	16	18	20	22
RM532	11	12	13	14	15	16	18	20	22
RM 534	18	20	22	24	26	29	32	35	40
RM 535	4	10	12	14	20	22	25	30	40
RM 536	7	10	12	14	16	16	16	16	20
RM 631	17	20	23	27	31	35	35	35	40

Table 3. Projected enrollment in proposed range and wildlife courses for 10 years.

COURSE	68-69	69-70	70-71	71-72	73-74	75-76	76-77
Wildlife Ecology	22	24	26	29	32	35	38
Upland Game Birds	11	12	13	14	15	17	19
Waterfowl Mgmt.	11	12	13	14	15	17	19
Watershed Mgmt.	10	11	12	13	14	15	16
Limnology	-	10	11	12	13	14	15
Fisheries Mgmt.	-	12	14	16	19	21	23
Wildlife Adm.	-	15	17	19	21	23	25
Habitat Analysis	6	7	8	9	10	11	12
Range Dissertation	5	6	7	8	9	10	11
Pop. Dynamics	6	7	8	9	10	11	12
W. Research Methods	5	6	7	8	9	10	11
Adv. Adna.	5	6	7	8	9	10	11
Wildlife Thesis	5	6	7	8	9	10	11
Aquatic Ecology	-	5	6	7	8	9	10
Fisheries Research	-	5	6	7	8	9	10
Wildlife Dissertation	-	-	3	4	5	6	7

a. Ecosystems Ecologist: To develop and sustain the Ph.D. program through coordination and definition of major land-use problems in Texas; to conduct seminars and research-oriented classroom activities; and to promote, through grant applications, continuing range management research.

b. Range Plant Physiologist: To support the undergraduate teaching responsibilities in those areas where student enrollments are rapidly increasing; to broaden the existing master's program and anticipated Ph.D. program.

10-years: In addition to the above faculty requirements, the following are projected needs for faculty:

a. Watershed Ecologist: To initiate and develop a basic training program with teaching responsibilities in the watershed management area.

b. Outdoor Recreationist: To initiate and develop basic and advanced training, including research, in outdoor recreation geared to arid and semi-arid regions in Texas and the Southwest.

c. Range-Forest Ecologist: To initiate and develop an undergraduate program in pre-forestry; to supplement undergraduate teaching responsibilities in the general range management curriculum.

Wildlife Personnel

Within the next five years at least one and, quite likely, two new faculty will be needed for wildlife management instruction. These positions will be needed to (a) supplement the rapid growth in the existing teaching loads (particularly RM 231 which currently enrolls 273 students per year), (b) to further develop graduate training programs in wildlife management at the Master's level, and (c) to broaden the scope and nature of the existing program. Specifically, we envision the following positions:

a. Behaviorist and Population Ecologist: To supplement undergraduate teaching loads; to develop advanced (senior and graduate levels) courses in animal behavior and population ecology; to direct thesis and independent research in his area of special interest.

b. Fishery Biologist: To initiate a program in fishery management at both the teaching and research levels. This position might wisely be a one-half time teaching appointment with the balance devoted to aquatic research.

Budgetary Requirements

Budgetary requirements for the next 10 years can only be estimated based on expected growth. The following tabulation reflects expected growth due to implementation of departmental plans. Inflation and salary increases are not considered.

1967-1968:

	Teaching	Research
Staff salaries [1]	$57,200.00	$41,000.00
Maintenance, Equipment and Travel	$ 5443.00	$40,000.00
TOTAL	$62,643.00	$81,000.00

1972-1973:

Staff salaries	$98,200.00	$98,200.00
Maintenance, Equipment and Travel	$10,000.00	$60,000.00
TOTAL	$107,200.00	$147,200.00

1977-1978:

Staff salaries	$117,200.00	$167,200.00
Maintenance, Equipment and Travel	$ 15,000.00	$ 60,000.00
TOTAL	$132,200.00	$227,200.00

[1] For actively teaching and research Range and Wildlife faculty only.

10-years: In addition to the above faculty requirements, the following are the projected needs:

a. Definite establishment of a fisheries program with the staff to support this phase of wildlife management. A second staff member in the area of this subject will be needed; his secondary interest should be wildlife physiology in general and, specifically, fish physiology.

b. Game Management Biologist: To sustain the anticipated doctoral program in wildlife management through coordination and definition of pressing demands in the area of game animal harvests; to conduct seminars and research-oriented classroom activities in support of graduate wildlife training; and to promote, through grant applications, continuing wildlife research.

Expected Activities

All staff members are expected to provide public service whenever possible. Technical and research society membership will be encouraged. The department hopes to increase public service through extension and shortcourses for high school students, college students and post graduates working for government agencies.

We also hope to obtain a workable experimental ranch for research and demonstration purposes. It would serve as a teaching lab for our students and the general public. All phases of research in native rangeland could be carried out.

Space Needs For Range And Wildlife Management Program:

I. Space Needs - Housing

A. The immediate housing needs for the range and wildlife management program (Fall 1968) are:

Facility	Number	Use
Office, staff[a/]	7	Permanent faculty
Office, teaching assistant	1	Teaching assistant
Office, secretarial	2	Secretaries
Office, graduate assistants	15 [b/]	Graduate students
Storage room, office equipment	2	Storage of office supplies
Storage room, equipment	1	Teaching aid storage
Storage room, research equipment	1	Delicate research equipment storage
Field house	1 [c/]	Lab and field equipment
Conference & meeting room	1	Staff conference

B. Space needs for staff in addition to the immediate needs in 1968 in 5 years (1973) and space needs for staff in addition to those specified for the 5-year period 10 years (1978):

The projection of space needs by 1973 and 1978 will reflect expected growth of staff, faculty and students plus expected addition of collaborators such as U.S. Forest Service, Agricultural Research Service and a wildlife unit.

Facility	Number (1973)	Number (1978) [d/]
Office, staff	8	3
Office, teaching & research asst.	21	28
Office, secretarial	2	2
Storage room, office equipment	2	2
Storage room, teaching equipment	0	1
Storage room, research equipment	1	1
Field house	0	0

[a/] Built-in closets, bookshelves, desk set, work table, air conditioning

[b/] Only space for 10 available now

[c/] None presently available

[d/] In addition to previous needs

II. Space Needs - Teaching

A. The immediate teaching space needs for the range and wildlife management program (Fall 1968) are:

Facility	Number	Use
1. Range Plants Teaching Lab	1	Range Plant Identification and Management
2. Wildlife Teaching Lab	1	Wildlife Management
3. General Lecture Room	1	Wildlife Mgmt. Range Plants
4. General Lecture Room	2	Upper level courses
5. Range Ecology and Watershed Lab	1	Range Ecology & Watershed Management
6. Statistics Lab	1	Statistics
7. Seminar and Reference Room	1	Seminar, Reference-Conference
8. Weighing and Drying Room	1	Plant Analysis

B. The 5-year teaching space needs (1973) listed below are in addition to the above immediate need requirements:

Facility	Number	Use
9. General Lecture Room (same as #3)	2	Added Courses
10. Agrostology and Plant Communities Lab	1	Agrostology & Ecology
11. Fire Laboratory	1	Fire Ecology & Research
12. Greenhouse	1	Teaching & Research

C. The 10-year teaching space needs (1978) for the range and wildlife program listed below are in addition to immediate and anticipated 5-year needs:

Facility	Number	Use
13. Wildlife Teaching Lab (dry)	1	Advanced & Graduate Courses
14. Behavior Laboratory	1	Advanced & Graduate Courses
15. Fish Management Lab	1	Fisheries Courses
16. Library and Reprint Room	1	All
17. General Lecture Room (Same as #4)	1	Added Courses
18. Research and Teaching Ranch	1	All

III. Research Space Needs for Range and Wildlife Program

A. The immediate research space needs for the range and wildlife program (Fall 1968):

Facility	Number	Use
18. Range research lab	1	Analytical research
19. Wildlife research lab (wet)	1	Graduate & FAculty
20. Greenhouse	1	Graduate & Faculty

B. Anticipated needs 5 years (1973):

21. Range research lab	1	Graduates & Faculty
22. Wildlife research lab	1	Graduates & Faculty
23. Experimental Ranch	1	All Research

C. Anticipated needs in 10 years (1978):

24. Fisheries research lab	1	Fisheries research
25. Watershed research lab	1	Watershed research
26. Range laboratories	1	Graduate research

Appendix A

Publications by the present staff for the period 1962 - 1968. Publications by staff members prior to the inception of the range program are not included.

DAHL, BILLIE E.:

Dahl, B.E. 1962. Soil moisture as a predictive index to forage yields. Paper presented at the 15th annual meeting Amer. Soc. Range Mgmt. Corpus Christi, Texas.

Dahl, B.E. 1963. Soil moisture as a predictive index to forage yield. J. Range Mgmt. 16:128-32.

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Dahl, B.E., A.E. Everson, J.J. Norris, A.H. Denham, 1967. Grass-alfalfa mixture for grazing in Eastern Colorado, Colo. Agr. Exp. Sta. Bull. 529S.

Everson, A.C., B.E. Dahl, and A.H. Denham. 1966. Controlling blowouts on sandhills rangeland. J. Range Mgmt. 19:147-48.

Dahl, B.E. and J.J. Norris. 1965. The effect of grazing intensity on native sandhill ranges, Eastern Colorado Range Station. Colo. Agr. Exp. Sta. P.R. 162.

Dahl, B.E. 1966. Trends in Range Conservation. Paper presented at the Hi-Plains Agric. Institute, Akron, Colo.

Dahl, B.E. and J.J. Norris. 1967. Twelve year summary of grazing intensity on native sandhill ranges. Colo. Agr. Exp. Sta. PR 207.

Dahl, B.E. and J.J. Norris. 1967. Fertilizer as a possible means of renovating intermediate wheatgrass. Colo. Agr. Exp. Sta. PR 206.

Denham, A.H., F.C. Daugherty, and B.E. Dahl. 1967. Grain and protein supplementation on short grass summer range 1965-66. Colo. Agr. Exp. Sta. PR 241.

KLEBENOW, DONALD A.:

Klebenow, Donald A. 1965. A montane forest winter deer range in Montana. J. Wildl. Mgmt. 29(1):27-33.

Klebenow, Donald A. and G.M. Gray. 1968. The food habits of juvenile sage grouse. J. Range Mgmt. 21(2):80-83.

WRIGHT, HENRY A.:

Wright, H.A. and J.Q. Klemmedson. 1965. Effects of fire on bunchgrasses of the sage brush - grass region in southern Idaho. Ecol. 46:680-688.

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Wright, H.A. Equations to predict yields of individual bunchgrasses (Manuscript submitted to USFS editor).

Wright, H.A. A method to determine heat-caused mortality in bunchgrasses. (Manuscript submitted to USFS editor).

Wright, H.A. An evaluation of several factors to determine why squirreltail is more tolerant to burning than needleandthread. (Manuscript in progress.)

Wright, H.A. Response of big sagebrush and three-tip sagebrush to season of clipping. (Manuscript in progress).

BOLEN, ERIC G.:

Bolen, E.G. 1962. A mandibular abnormality in the wood duck. Auk 79(4):712.

Bolen, E.G. 1962. Nesting of the Black-bellied Tree Duck in South Texas. Aud. Field Notes 16(5):482-485.

Bolen, E.G. 1964. Tracer on tree ducks. Texas Game and Fish 22(1):21-28.

Bolen, E.G. 1964. Plant ecology of spring-fed salt marshes in western Utah. Ecol. Mono. 34(2):143-166.

Bolen, E.G. 1964. Weights and linear measurements of black-bellied tree ducks. Texas J. Sci. 16(2):257-260.

Bolen, E.G. 1967. Nesting boxes for black-bellied tree ducks. J. Wildl. Mgmt. 31(4):794-797.

Bolen, E.G. 1967. Tree duck roundup. Bull. Texas Ornith. Soc. 1(2):2-3, 14.

Bolen, E. G. and B.J. Forsyth. 1966. Foods of the black-bellied tree duck in South Texas. Wil. Bull. 79(1):43-49.

Bolen, E.G., B. McDaniel and C. Cottam. 1964. Natural history of the black-bellied tree duck (Dendrocygna autumnalis), in southern Texas. Southwestern Nat. 9(2):78-88.

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Bolen, E.G. and B.W. Cain. 1968. Mixed wood duck-tree duck clutch in Southern Texas. Condor, in press.

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Rylander, M.K. and E.G. Bolen. Ecological and anatomical adaptations of North American tree ducks. (Manuscript submitted to American Midland Naturalist).

SCHUSTER, JOSEPH L.:

Schuster, J.L. and L.K. Halls. 1962. Timer overstory determines deer forage in shortleaf-Loblolly pine-hardwood forests. Proc. Amer. Soc. Foresters. p. 165-167.

Schuster, J.L. 1964. Root development of native plants under three grazing intensities. Ecol. 45:63-70.

Schuster, J.L. and C.H. Wasser. 1964. The nailboard method of root sampling. J. Range Mgmt. 17:85-87.

Schuster, J.L. and W.D. Duke. 1964. A forage-sample dryer. J. Range Mgmt. 17:88-89.

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Halls, L.K., and J.L. Schuster. 1965. Tree herbage relations in pine-hardwood forests of Texas. J. Forestry. 63:82-83.

Albin, R.C. and J.L. Schuster. 1966. Adaptations of drylot procedures to a commercial ranching operation. Paper presented at 19th Annual Meeting of American Society of Range Management, pp. 25-26.

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Albin, R.C. and J.L. Schuster. 1966. Techniques of wintering the cow herd.Texas Technological College School of Agriculture Livestock and Feeders Day Report, pp. 79-82.

Schuster, J.L. and R.C. Albin. 1966. Drylot wintering of range cows - adaptations to the ranching operation. J. Range Mgmt. 19:263-268.

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Trlica, M.J. and J.L. Schuster. 1967. The effects of burning on the native vegetation of the Texas High Plains. 1967 Texas Tech Research Farm Report, pp. 66-69.

Bryant, D.A. and J.L. Schuster. 1967. Day versus night spraying of plains pricklypear. 1967 Texas Tech Research Farm Report, pp. 73-75.

Schuster, J.L. 1967. Tech leads brush fight. The Texas Techsan 18:2-4.

Schuster, J.L. 1967. The relation of understory vegetation to cutting treatments and habitat factors in an east Texas pine-hardwood type. Southwestern Nat. 12:339-364.

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Ellis, Dalton and J.L. Schuster. 1968. Juniper age and distribution on an isolated butte in Garza County, Texas. Accepted for publication in The Southwestern Naturalist.

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Thomas, G.W. 1962. Administration and functions of pantech research farm. Field Day Report - PanTech Research Farm, Pantex, Texas.

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Thomas, G.W., R.M. Durham and Larry Howe. 1964. Observations on coprophagy in farm animals. J. of Animal Science, 23:3 (873) with R.M. Durham and Larry Howe.

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Box, T.W., Jeff Powell, and D.L. Drawe. 1967. Influence of fire on South Texas. Ecol. 48:955-961.

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Box, T.W. 1967. The professor of agriculture in the expansion of knowledge. J. of National Assn. for College Teachers of Agriculture. Submitted for publication.

Box, T.W. 1967. The West Texas range - a look back and a look ahead. The Cattleman.

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Drawe, D.L. and T.W. Box. 1968. Influence of fertilizer on yield and composition of vegetation on Zavala Sandy Loam. J. of Range Mgmt. Submitted for publication.

Appendix B

Current Research in Range and Wildlife Management

TTA-4-39 - Studies of the Ecology of the Rangelands of Texas (in cooperation with the Post Montgomery Estate and the Welder Wildlife Foundation) - Dr. Thadis W. Box.

TTA-4-41 - Adaptations of Drylot Procedures to a Commercial Ranching Operation (in cooperation with Forrest Ranch, Grain Sorghum Producers Assn., and Wilbur Ellis Company) - Dr. J.L. Schuster and Dr. Robert C. Albin.

TTA-4-51 - Studies of Deferred-Rotation Grazing (in cooperation with Post-Montgomery Estate) - Dr. Thadis W. Box.

TTA-4-52 - A Study of Winter Supplementation of Range Cattle with Cotton By-Products and/or Plains Grown Feed Grain (In cooperation with Post-Montgomery Estate, Texas Agricultural Experiment Station) - Dr. Thadis W. Box.

TTA-4-53 - Development of a Research Reference Herbarium for the Post-Montgomery Ranch (in cooperation with the Post-Montgomery Ranch) - Dr. Thadis W. Box.

TTA-4-54 - Food Habits of the White-Tailed Deer (in cooperation with Welder Wildlife Foundation) - Dr. Thadis W. Box.

TTA-4-55 - A Study of the Effects of Mechanical Brush Control Practices on Plant Succession and Rangeland Production (in cooperation with Welder Wildlife Foundation) - Dr. Thadis W. Box.

TTA-4-56 - (WWF65R3) Forage Preference Ratings for Deer and Cattle (in cooperation with Welder Wildlife Foundation) - Dr. Thadis W. Box.

TTA-4-57 - Studies in Range Fertilization in South Texas (in cooperation with Welder Wildlife Foundation) - Dr. Thadis W. Box.

TTA-4-58 - Techniques and Methods for Vegetation Evaluation - Dr. Joseph L. Schuster.

TTA-4-65 - Life History Studies of the Black Bellied Tree Duck (Dendrocygna Autumnalis)in South Texas (in cooperation with the Bureau of Sport Fisheries & Wildlife, USDI) - Dr. Eric G. Bolen.

TTA-4-67 - A Study of Jackrabbit Populations in Relation of Habitat Preferences in the Southern High Plains of Texas (in cooperation with the Bureau of Sport Fisheries & Wildlife, USDI) - Dr. Eric G. Bolen.

TTA-4-69 - The Influences of Vegetation of Arid and Semi-Arid Zones on Its Microclimate - Dr. J.L. Schuster.

TTA-4-75 - Ecology of Blue and Green Winged Teal in the Texas Panhandle - Eric G. Bolen.

TTA-4-76 - Population Characteristics of Jackrabbits - Dr. Eric G. Bolen.

TTA-4-80 - The Ecology and Control of Juniper - Dr. Joseph L. Schuster

TTA-4-81 - Physiological Effects of Top Removal on Mesquite, Juniper, and Other Brush Species - Dr. Henry A. Wright

TTA-4-82 - Effects of Fire on Mesquite and Other Brush Species - Dr. Henry A. Wright.

TTA-4-83 - Management Practices for Increased Animal Production Following Mesquite and Other Brush Control - Dr. Bill E. Dahl.

TTA-4-84 - Soils and Soil Moisture Relationships As they Effect Control of Mesquite and Other Brush - Dr. Bill E. Dahl.

TTA-4-85 - The Combination of Mechanical, Chemical, and Fire Control Methods for Maintenance Control of Mesquite and Noxious Brush (in cooperation with Phares-Wilkins Company and R.B. Masterson Ranch) - Dr. J.L. Schuster

TTA-4-86 - Influence of Fire on Texas Rangelands (in cooperation with Welder Wildlife Foundation) - Thadis W. Box.

TTA-4-90 - Phytogeography of Mesquite (Prosopis spp.) in the Western Hemisphere. Dr. Chester M. Rowell, Jr.

TTA-4-92 - Effects of Brush Control on Whitetailed Deer - Dr. Donald A. Klebenow.

TTA-4-93 - Effects of Brush Control on Scaled & Bobwhite Quail - Dr. Donald A. Klebenow.

TTA-4-94 - Scaled Quail Ecology Study - Dr. Donald A. Klebenow

- Dry season food habits of the mule deer on the foothills of Carlsbad Caverns National Park. Mr. Derrick C. Cook and Dr. D.A. Klebenow.

- Survey of Golden Eagle-Livestock Relationships (Administered by ICASALS) Dr. Eric G. Bolen, Dr. R. Packard, Dr. K. Rylander, Dr. Frank Hudson.

TTA-5-58 - Seasonal Diets of Beef Cattle on Native Range - Dr. Robert C. Albin and J.L. Schuster.

Texas Technological College Research Farm Projects

TTA-8-28 - Development of a Research Reference Herbarium at the Texas Tech Research Farm - Dr. J.L. Schuster.

TTA-8-29 - The Effects of Fire on the Native Vegetation of the Texas High Plains - Dr. J.L. Schuster.

TTA-8-30 - Investigations in Range Revegetation on the Texas High Plains - Dr. J.L. Schuster.

TTA-8-31 - The Use of Chemical, Cultural and Biological Range Improvement Practices in the Texas High Plains - Dr. J.L. Schuster.

TTA-8-32 - Cattle Preference and Production of Native and Interseeded Grasses of the Texas High Plains - Dr. J.L. Schuster.

Preliminary Investigations in Range and Wildlife Management

Drought Kill of Plants in South Texas - Dr. Thadis W. Box.

Influence of Drought and Grazing on Mortality of Reseeded Range Grasses - Dr. Thadis W. Box.

Food Habits of the Javelina in South Texas - Mr. Richard S. White (special problem)

Cooperation with other Colleges

TTA-4-88 - The trend and possible control of certain understory brush species in Jones and Nolan Counties, Texas - Dr. F. M. Churchill, Abilene, Christian College.

TTA-4-89 - The Ecology and Control of persimmon - Dr. Young, Southwest Texas State College.

TTA-4-87 - Some possibilities of control of creosotebush (Larrea divaricata car.) - R.E. Steger and E.E. Turner (Sul Ross State College).

RESEARCH FARM

Medium and Long Range Plans For Texas Technological College Research Farm

1. Historical Information and Recent Developments

A. Orgin and development of Texas Technological College Research Farm.

Texas Technological College began operating a part of the Pantex Ordnance Plant October 1, 1947, under a lease agreement. Research on "Wheat Pasture Poisoning" was initiated that year as a cooperative effort between the U.S. Department of Agriculture, the Texas Agricultural Experiment Station, and Texas Technological College. These organizations were also requested to study the critical problem of urinary calculi in livestock. Although certain phases of this research have been transferred to College Station, the Texas Agricultural Experiment Station is a continuing cooperator on most phases of the present research program at Pantex.

The General Services Agency of the government declared the original 16,076 acre Pantex Ordnance Plant a munitions reserve site, and Texas Tech made an educational-use application in 1948. The plant was deeded to the College in 1949, subject to a recapture clause. The government exercised the recapture clause on February 16, 1951 for more than 10,000 acres of the original plant site.

At present, Texas Tech holds a deed to 5,821.8810 acres at an inventoried value of $1,523,660. In addition, the College has an agricultural permit on approximately 8,000 acres of land now operated by the Atomic Energy Commission.

The Texas Technological College Research Farm, Pantex, Texas, is operated as a non-profit subsidiary of the School of Agriculture. The primary functions are research, public service and support of resident instructional programs at Texas Technological College.

The research program is carried out through a project structure which makes effective use of qualified faculty members and graduate students, both on the Research Farm and in the subject matter departments at Texas Tech. Progress reports on each of these research projects are made a part of this presentation.

Public service is provided through the Beef Cattle Performance Testing Program, through field days, and by special tours arranged at the request of interested individuals and groups.

The Research Farm aids in the instructional program at Texas Tech by serving as a field laboratory for agricultural students. Opportunities are provided at the Farm for studies of livestock, crops, soils and water use. Some faculty members are jointly utilized between the College and the Farm, and some graduate students help in the conduct of research.

The Research Farm is administered through the Board of Directors of Texas Technological College, the President, the Vice-Presidents, the Dean of Agriculture who is also Director of Farms, and the Farm Superintendent located at Pantex.

B. Graduate Assistantship Program

Graduate Assistantships are provided in several phases of agriculture at Texas Technological College Research Farm including Animal Science, Agronomy, Range Management, Agricultural Economics and Entomology. Each recipient of an Assistantship is required to spend a minimum of three months at the station in order to conduct the research required for completion of a Masters Degree. The individual research stipend amounts to a total of $3,135.00 for a 12-month continuous period (includes house and utilities for 3 months valued at 135.00). The number of assistantships supported from Texas Technological College Research Farm funds for the past few years, has ranged from four to seven within any particular year.

C. Professional Staff Members (Present)

Individual	Rank	% of Salary Financed by TTCRF
Dr. Gerald W. Thomas	Dean of Agriculture and Director of Farms	
Dr. Richard Dale Furr	Superintendent and Professor of Animal Husbandry	100
Dr. Lloyd B. Sherrod	Animal Nutritionist and Associate Professor of Animal Husbandry	100
Mr. Keith Roger Hansen	Assistant Animal Husbandman	100
Dr. Joseph L. Schuster	Associate Professor of Range Management	Part
Dr. Frank A. Hudson	Associate Professor of Animal Husbandry	Part

D. Professional Staff Members (Partial List of Past)

Individual	Rank	Years
Mr. J.P. Smith	Manager	1947-63
Mr. Jerry Thomas	Agronomist	1957-62
Mr. L.A. Maddox, Jr.	Asst. Animal Husbandman	1948-53
Dr. George F. Ellis, Jr.	Manager	1963-65
Mr. James A. Carpenter, Jr.	Asst. Animal Husbandman	1963-66
Dr. Douglas F. Owen	Agronomist	1963-66
Dr. Frank Sims	Asst. Animal Husbandman	
Dr. Donald Ashdown		
Mr. N. Calliham	Asst. Animal Husbandman	
Mr. Eldon Cleveland	Associate Entomologist	
Mr. Jack Bond	Agronomist	

E. Publications by Present Staff Members

(attached)

F. Budget

For the past few years, the budget has been approximately as follows:

Salaries (including assistantships)	Maintenance, Equipment and Travel
$80,000 to $100,000	$60,000 to $80,000

. Summary of Current Departmental Status

A. Graduate Assistants

As of September 1, 1968, there will be a minimum of six graduate students pursuing a course of study toward an M.S. Degree.

B. Present Staff and Compensation (1967-68)

Staff Members	Rank	Salary
Dr. Gerald W. Thomas	Dean of Agriculture and Director of Farms	
Dr. Richard Dale Furr	Superintendent and Professor of Ani. Husbandry	$18,500.00 (a)
Dr. Lloyd B. Sherrod	Animal Nutritionist and Assoc. Prof. of Animal Husbandry	13,040.00 (a)
Mr. Keith R. Hansen	Asst. Animal Husbandry	8,040.00 (a)

Staff Member	Rank	Salary
Dr. Joseph L. Schuster	Assoc. Prof. of Agronomy and Range Management	$2,000.00(b)
Dr. Frank A. Hudson	Assoc. Prof. of Animal Husbandry	1,833.00(c)

(a) Includes house and utilities valued at $540.00.
(b) Contract for one-half time July 11, 1968 through August 22, 1968.
(c) Contract from July 11, 1968 through August 22, 1968.

C. Total Space Available

(1) Land Area
(a) Texas Tech holds a title to 5821.8810 acres.
(b) Texas Tech has an agriculture use permit on approximately 8,000 acres of land operated by the Atomic Energy Commission.

(2) Buildings

Those buildings of primary utility owned by Texas Tech would include (1) ten staff houses, (2) Killgore Beef Cattle Center, (3) warehouse buildings 9-7 and 9-9 with 62,870 square feet, (4) warehouse building 2-4 with 25,000 square feet, and (5) one-hundred-two igloo structures each containing 1560 square feet. A number of additional buildings are available for use.

D. Research Activities

A list of active research projects for 1968 is attached.

E. Extension or Adult Educational Activities

During the past year, the professional staff located at Pantex has participated in approximately 30 TV and radio programs, about 50 guest speaking appearances, received 10 visitors per weekday, and 30 phone calls per day. The total number of individual research reports distributed has exceeded 25,000 in addition to numerous newspaper and magazine articles concerning research results. The Annual Performance Registry International Conference was held at the Killgore Beef Cattle Center in August, 1967 and the Annual Field Day March 28, 1968 (about 700 in attendance). Eleven reports were presented at Scientific Society Meetings in the Summer of 1968 resulting in eleven publications in scientific journals.

F. Current Budget (1967-68)

Item	Amount
Salaries	$ 89,203.00
Assistantships	12,540.00
Maintenance, Equipment and Travel	64,757.00
Total	$166,500.00

3. Medium and Long-Range Objectives and Goals

Introduction

Texas Technological College Research Farm is probably the largest self-supporting research station in the United States. With 14,000 acres and the ultra modern Killgore Beef Cattle Center, the potential contribution to practically all phases of Agriculture is unlimited. Present research involves soil, water, agronomy, range management, entomology, economics, animal nutrition, animal breeding, and engineering. Additional funds are sorely needed to maximize research, public service, and support of resident instructional program at Texas Technological College. Three major factors are intimately associated with future development and expansion. These are: (1) Securing of state appropriated funds, (2) securing of "outside" monies (private grants, etc.) and (3) water availability and supply.

In preparing the following medium and long-range plans, it has been assumed (to a certain extent) that additional funds will be available and the water supply will be significantly increased.

A. Major Areas of Research in 1973 and 1978

(1) Livestock research with paramount emphasis in the fields of nutrition, breeding, management, physiology and meats. Species will include beef cattle, sheep and swine.

(2) Water and soil conservation research as related to efficiency of utilization and to the specific problems of the Panhandle of Texas. Use of sewage effluent as an irrigation resource and its' influence relative to specific crops and soil characteristics will receive major attention. Water pollution as related to sewage usage and feedlot solid waste disposal will be studied.

(3) Agronomy and range management research with emphasis toward maximizing crop and livestock production and resolving production problems of the High Plains Area.

(4) Economic and engineering research as related to the above listed areas of research.

B. Medium and Long-Range Plans for Livestock Research

(1) Nutrition, Meats and Management

Efficiency of beef cattle production will undoubtedly

become increasingly important in the future as increases in efficiency of production by non-ruminant species and the increases in human population bring greater competition for the available grains and other food sources which can be consumed directly by non-ruminant animals and by humans. Improvement of feed efficiency (conversion of feed to edible product) is an important area for research in decreasing the overall production costs in the feedlot phase of the beef cattle industry. Considerable progress has been made in increasing feed efficiency during the last several years through improved breeding, management and feeding techniques, however greater improvements are certainly possible through further research and the application of new research information.

Ruminant animals possess the unique ability to utilize roughages and other nutrient sources such as non-protein nitrogen which for the most part cannot be utilized by other species of animals for economical production. Roughages will probably become increasingly more important in ruminant rations as competition for feed grains increases. Information is needed concerning techniques for improving the utilization of the large quantities of roughages available in the Texas High Plains and other areas of the country. In addition, many waste and by-product materials offer great potential as possible feed sources for ruminant animals. Research data are very limited regarding the feasibility of utilization of these type products as animal feeds.

The animal nutrition research program at Texas Technological College Research Farm over the next 10 years will be designed to provide information in these three general areas:

(a) Improvement of feed efficiency in fattening beef cattle.
(b) Determination of the nutritive value of various forages and grasses and establish methods for increasing the utilization of forage nutrients.
(c) Exploration of the nutritive value and utilization of different by-products in ruminant rations.

Studies concerning the improvement of feed efficiency in the feedlot will be conducted to evaluate such factors as improved varieties of grain sorghum, methods of processing, nutrient balance, concentrate to roughage ratio, various growth stimulants and feed additives, and combinations of these, for increasing feed efficiency in fattening beef cattle. These studies will be designed to study specific variables in addition to the effects

of combinations and interactions. Various research techniques and response criteria will be used in these studies including animal performance, feed consumption, feed conversion, carcass characteristics, nutrient digestibility and balance, and carcass energy retention.

Similar techniques and response criteria will be used in the forage evaluation research. In addition, grazing animal digestibility and *in vitro* techniques will also be employed. These studies will include the evaluation of the different forages and grasses *per se* as well as determining methods for improving forage nutrient utilization such as supplemental nutrients and different techniques in growing, harvesting, preparation and storage of roughages. Where feasible, the portions of forages actually consumed will be studied using grazing animal digestibility techniques. The use of new plant species as potential forage crops will also be evaluated in this phase of the animal nutrition research program.

Research concerning the use of different by-products in livestock rations will be conducted to determine the feasibility of using a particular by-product by procedures such as chemical analysis, animal performance and digestibility - nutrient balance to evaluate the by-product alone and in different combinations with several standard feed ingredients. In addition, any adverse affects on the animals or on the animal products will also be established. Various techniques will be explored to improve the nutritive value and permit maximum utilization of the by-product in livestock rations. These techniques will include processing methods such as physical form, carrier materials, and extraction of certain fractions; supplying possible deficient nutrients; and establishing optimum levels and combinations with other specific ration ingredients compatible with maximum ration utilization by the animal.

Research at Texas Tech College Research Farm contributes part of the graduate research program toward the granting of M.S. Degrees in the College of Agriculture. The previously outlined animal nutrition research program could materially contribute to the expansion of the graduate program and granting of graduate degrees by the College of Agriculture at Texas Tech.

(2) Breeding, Physiology, Meats and Management

There is an evergrowing need for the development of new tools and management systems to meet the demands of the Beef production industry, which is becoming a more highly intensified and specialized industry as demand for

more economical production increases.

Texas Technological College Research Farm is in an excellent position to take an active part in the development of these new methods and tools, situated in the High Plains of Texas, the most rapidly growing fat cattle producing area in the United States. With the rapid population increase of not only the U.S. but also of the world, economical meat production must be developed to keep pace with the also growing demands.

The most logical starting place toward this end is the producer. At this level, there is a need for research in:

(a) genetic improvement of beef cattle through selection and crossbreeding to attain more rapidly gaining, efficient individuals for use in producing our future meat animal.
(b) reproductive efficiency through the use of crossbreeding and physiological studies with hormone control.
(c) management systems for efficient use of grain and forage production. More and more land is being taken from use as rangeland for recreation and accommodation of suburban areas, therefore confinement cow-calf operations are worthy of considerable research.

Beef Cattle Improvement and meat sire evaluation is an important part of the overall genetic improvement program at Texas Technological College Research Farm and will be continuing.

Through this program potential beef sires are tested, with the cooperation of registered breeders from a four state area, for traits which will yield efficient, meat producing progeny. Top sires are identified and disseminated throughout herds in the Southwest.

Crossbreeding programs have been developed with planned future expansion. Including the use of certain dairy breeds to determine their value in prolonging improving lactation as well as growth rate and reproductive efficiency.

Considerable research is warranted and planned in the area of confinement and semi-confinement cow-calf management. This area of research includes, the development of an animal adapted to confinement through crossbreeding, nutritional requirements of cows in confinement, and hormonal research with respect to reproduction.

Selection criteria is of primary concern to the beef producer. Project S-1129, Selection by Four Different Criteria, has been operational for approximately 14 years at Texas Tech Research Farm striving to gain knowledge as to the most effective selection criteria. As crossbreeding advances in popularity, there will also be a need for the selection of the most advantageous purebred animals to implement this program. We have determined the ability to improve herds through selection. The next step to complete this study will be to investigate the physiological and hormonal differences of the animals due to selection.

In each study, a more complete and detailed expansion of carcass data will be taken, utilizing Texas Tech meat Laboratory whenever possible. All breeding research will be related to quantitative and qualitative carcass characteristics.

Swine breeding and nutrition research will be initiated to complement the swine research program at Texas Tech. This work will be supervised by the appropriate swine specialists in the Animal Husbandry Department. All Animal Husbandry research will be coordinated with the Animal Husbandry Department in order to maximize total effort and keep duplication to a minimum.

C. Medium and Long-Range Plans for Soil and Water Conservation Research

(1) The land includes 2 large playa lakes which will be used by Agricultural Engineers to study designs for modification to reclaim the soil for crop use and to reduce or prevent evaporation when rainfall run-off accumulates in the lakes. Systems for utilization of run-off water and designs for preventing run-off from surrounding crop lands and recharge of surface run-off into the underground aquifier will be studied.

(2) Sewage effluent is available to Tech Research Farm from AEC and Amarillo Air Force Base. Additional data will be collected on methods of storing and distributing sewage effluent and the effect of sewage effluent on various crops and soil characteristics (chemical, physical and biological).

(3) New underground low-volume plastic pipe for use in short irrigation-water areas needs to be studied in the soil type found on the farm which is representative of several million acres in the high plains of Texas and Oklahoma.

(4) Studies of cropping systems, rotations, and soil and water management practices under low-rainfall and short irrigation-water conditions will be conducted.

(5) By 1978, assuming adequate funds, Texas Tech College Research Farm should have 1,000 acres under irrigation. This will have assisted in: (1) stabilizing the farm income, (2) supplying adequate water for irrigated crop and pasture research and providing an abundant feed supply for livestock research.

D. Medium and Long-Range Plans for Agronomy and Range Management Research

(1) Crop and pasture forage research will be continued and expanded in relation to: (1) new specie introductions, (2) rate and type of fertilization, (3) palatability, (4) quality as related to livestock requirements, (5) water requirements, (6) response to grazing pressure, (7) value of grazing vs. green chopped or ensiling, (8) weed control, (9) seeding and spacing rates and (10) various management and rotation systems.

(2) Most of the aforementioned studies will still be in progress by 1978. In addition, increased laboratory studies will be in progress in relation to quality. Considerable green-house research should be in progress.

E. Medium and Long-Range Plans for Agricultural Economics Research

As indicated earlier, where applicable, economic research will be conducted as related to other research projects. In addition, considerable data will be collected and research in progress in relation to: (1) developing an improved record keeping system, (2) use of electronic data processing of records, (3) evaluation of different record keeping systems and (4) type of data to be recorded. Other research will be initiated and conducted as deemed desirable by the Agriculture Economics Department at Texas Technological College. As indicated in other sections, this phase of the research program will be expanded so as to complement the overall Agricultural Economics Program and will be supervised by members of that department unless a part-time or full-time position can be financed for or by the station.

F. Medium and Long-Range Plans for Agricultural Engineering Research

The agricultural engineering research program will be de-

signed so as to enhance and complement total effort in this field at Texas Technological College. This program should be intimately associated with soil and water conservation research, solid waste disposal research and livestock equipment design. Supervision of this research will be conducted by members of the Agricultural Engineering Department at Texas Technological College unless a part-time or full-time position can be financed for or by the station.

G. Medium and Long-Range Plans for Extension or Adult Education Activities

The activities as outlined under 2 (E) will be continued. Specialized Field Day Programs will be initiated in (1) Beef Cattle Research, (2) Range Management and Agronomy and (3) others. Mass media dissemination of research results will continue to include radio, TV, newspapers, magazines, special reports, field day reports and others. A part or full-time position related to public information would greatly enhance the total program at Texas Technological College Research Farm.

H. Utilization of Present Facilities

The facilities as listed under 2 (C) will be utilized to a maximum in accordance with the aforementioned research and education program. All ten staff houses need major repair amounting to a minimum of $2,000.00 each.

I. New Facilities

Proposed Expansion of Facilities

		Est. Initial Cost	Est. Annual Oper. Cost
Laboratory	- Completion of present laboratory into a fully functional research unit.	$ 8,000.00	$ 2,500.00
Cattle Working Facilities	- Six pens with a total capacity for accomodating 150 cows in a confinement beef program.	9,000.00	1,000.00

		Est. Initial Cost	Est. Annual Oper. Cost
Specialized Equipment	- Small plot-type equipment to be used primarily in Agronomy and Range Management Research	$12,000.00	$ 2,000.00
Greenhouse	- To be used primarily in Agronomic Research (plant breeding and nutrition)	8,000.00	1,000.00
Digestion Unit	- Twelve stalls for steers designed for total feces and urine collection.	1,500.00	500.00
Steer Feeding Facility	- Construction of steer feeding facility with a total capacity of 250 head including 50 pens for individual feeding.	6,000.00	1,000.00
Large Equipment	- To be used in the farming program.	50,000.00	6,000.00
Sheep and Swine	- Modification of present buildings for sheep and swine research.	1,500.00	1,000.00

J. Additional Personnel and Graduate Assistants

Number	Position	Annual Salary
1	Agronomy and Soils	$12,000.00
1	Laboratory Technician	7,500.00
1	Range Management	12,000.00
½	Agricultural Engineering	7,000.00
½	Agricultural Economics	7,000.00
½	Public Information	5,000.00
½	Animal Breeding	7,000.00
½	Animal Nutrition	7,000.00
6	Full-time farm employees	30,000.00
1	Secretary	4,500.00

Number	Assistantships	Annual Stipend (each)
2	Agricultural Engineering	$ 3,500.00
2	Agricultural Economics	3,500.00
2	Animal Breeding	3,500.00
2	Meat Science	3,500.00
3	Animal Nutrition	3,500.00
2	Agronomy and Soils	3,500.00
2	Range Management	3,500.00

RESEARCH PROJECTS
AT
TEXAS TECHNOLOGICAL COLLEGE RESEARCH FARM
-1968-

TTA-8-2 - Improvement of Beef Cattle Through Selection of Performance-Tested and Progeny-Tested Sires (In cooperation with Texas Agricultural Experiment Station) - Mr. K.R. Hansen

TTA-8-4 - Weed Control Studies (In cooperation with Texas Agricultural Experiment Station and U.S. Department of Agriculture) - Dr. A.F. Wiese and Dr. R.D. Furr

TTA-8-6 - (TAES S1129) - A Comparison of the Performance of Beef Cattle Selected by Four Different Criteria (In cooperation with Texas Agriculture Experiment Station) - Mr. K.R. Hansen

TTA-8-9 - Ensilage Variety Tests at Texas Technological College Research Farm - Dr. A.W. Young and Dr. R.D. Furr

TTA-8-16 - Preliminary Investigations in Range Management

TTA-8-17 - Preliminary Investigations in Animal Science

TTA-8-18 - Preliminary Investigations in Entomology

TTA-8-19 - Preliminary Investigations in Agricultural Economics

(a) A Cost Analysis of Beef Cattle Feedlot Operations - Dr. James E. Osborn
(b) Time, Weight and Feed Variables as Related to Economics in Feedlot Operations - Dr. James E. Osborn
(c) Economics of Various Farm Programs for Texas Tech College Research Farm - Dr. James E. Osborn

TTA-8-20 - Preliminary Investigations in Agronomy

(a) A Genetic and Morphological Study of Pullman Soils (In cooperation with U.S. Department of Agriculture, Agriculture Research Service, Bushland, Texas, and the Texas Tech Geology Department) - Dr. B.L. Allen

TTA-8-24 - Nitrogen and Mineral Content of Various Forage Sorghum Varieties and the Effect of Sulfur, and Minor Elements on Yield and Nutritive Value of Native Grass Pasture in the High Plains of Texas - Dr. A.W. Young, Dr. R.D. Furr, and Mr. Dale Rogers

TTA-8-28 - Development of a Research Reference Herbarium at the Texas Technological College Research Farm - Dr. J.L. Schuster

TTA-8-29 - The Effects of Fire on the Native Vegetation of the Texas High Plains - Dr. J.L. Schuster

TTA-8-30 - Investigations in Range Revegetation on the Texas High Plains - Dr. J.L. Schuster

TTA-8-31 - The Use of Chemical, Cultural, and Biological Range Improvement Practices in the Texas High Plains - Dr. J.L. Schuster

TTA-8-32 - Cattle Preference and Production of Native and Improved Forages of the Texas High Plains - Dr. J.L. Schuster, Dr. R.D. Furr, and Mr. K.R. Hansen

TTA-8-34 - Effect of Different Sources of Supplemental Nitrogen in All-Concentrate Feedlot Rations With and Without Chlortetracycline - Dr. R.D. Furr

TTA-8-35 - An Evaluation of Feedlot Performance, Ration Digestibility, and Energy Utilization with Steers Fed Different Types of Brown Seeded Dwarf Sorghum Endosperm - Dr. Lloyd B. Sherrod

TTA-8-36 - The Effect of Sewage Effluent and Fertilizer on the Yield and Quality of Irrigated Grain Sorghum - Dr. L.B. Sherrod

TTA-8-37 - Effect of Feeding Either Chlortetracycline or Sulfamethazine or a Combination to Stressed Feeder Cattle - Dr. R.D. Furr

TTA-8-38 - Mineral Supplementation to All-concentrate NPN Supplemented Rations with and without Chlortetracycline - Dr. R.D. Furr

TTA-8-39 - Effect of Different Levels of Stilbestrol for Cattle Fed All-concentrate Finishing Rations - Dr. R.D. Furr

TTA-8-40 - Variation in Quality of Grain Sorghum as Obtained at a Commercial Elevator - Dr. R.D. Furr

TTA-8-41 - The Nutritive Value of a New Waxy Grain Sorghum for Ruminants - Dr. L.B. Sherrod

TTA-8-42 - A Comparison of Performance of Beef Cattle Wintered on Grain Sorghum Fields, Forage Sorghum Silage, and Native Pastures with Later Feedlot and Carcass Traits - Dr. R.D. Furr

TTA-8-43 - A Comparison of Antibiotics and Different Sources of Supplemental Nitrogen in an All-concentrate Finishing Ration - Dr. R.D. Furr

TTA-8-44 - Solid Waste Accumulation and Disposal from Cattle Feedlots - Dr. R.D. Furr

TTA-8-45 - A Comparison of Roughage Sources in High Grain Sorghum Finishing Rations - Mr. K.R. Hansen

TTA-8-46 - Different Levels of Ammoniated and Raw Ricehulls in High Energy Feedlot Rations - Dr. R.D. Furr

TTA-8-47 - Influence of Different Levels of Added Moisture upon the Utilization of Reconstituted Regular and Waxy Grain Sorghum by Ruminants - Dr. L.B. Sherrod

TTA-8-48 - Nutritive Value of Kochia Silage Harvested at Different Stages of Maturity - Dr. L.B. Sherrod

TTA-8-49 - Nutritive Value of Ruminant Rations Containing Various Levels of Pepo: - Dr. L.B. Sherrod

TTA-8-50 - Evaluation of Partially Treated Effluent as an Irrigation Resource - Dr. R.D. Furr and Dr. Dan Wells

Publications
K. R. Hansen

Hansen, K.R. 1968. Relationship of production factors and carcass traits in the growth and development of the bovine. M.S. Thesis, Texas Technological College, Lubbock, Texas.

Hansen, K.R., and R.D. Furr. 1968. Beef Cattle Improvement and meat Sire evaluation tests. Texas Tech. College, Int. Center for Arid and Semi-Arid Land Studies. Spec. Rpt. No. 4:43.

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